

Alaska Outer Continental Shelf Region

Alaska Annual Studies Plan

Final

FY 2001-2002

Prepared by
U.S. Department of the Interior
Minerals Management Service
Alaska Outer Continental Shelf Region
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ACRONYMS, INITIALISMS, ABBREVIATIONS, AND SYMBOLS

ABL	Auke Bay Laboratory
ADF&G	Alaska Department of Fish and Game
AEPS	Arctic Environmental Protection Strategy
AEWC	Arctic Eskimo Whaling Commission
AFTC	Alaska Frozen-Tissue Collection AK - Alaska
AK	Alaska
AMAP	Arctic Monitoring and Assessment Program
AMMTAP	Alaska Marine Mammal Tissue Archival Project
ANCSA	Alaska Native Claims Settlement Act
ANWR	Alaska National Wildlife Refuge
ASP	Annual Studies Plan (Alaska OCS Region)
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRD	Biological Resources Division (USGS)
C	Celsius
CAFF	Conservation of Arctic Flora and Fauna [working group]
CD-ROM	Compact Disk Read Only Memory
C.F.R.	Code of Federal Regulations
CI	Confidence Interval
CIRCAC	Cook Inlet Regional Citizens' Advisory Council
cm	centimeter
CMI	Coastal Marine Institute
COZOIL	Coastal and Surf Zone Oil-Spill-Transport Model
CP	Comprehensive Program
CTD	conductivity-temperature-density [instrument]
DOI	Department of Interior
DPP	Development and Production Plan
EAS	Environmental Assessment Section
ECMRWF	European Center for Medium Range Weather Forecasting
e.g.	for instance
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESP	Environmental Studies Program
ESSP	Environmental Studies Strategic Plan
EVOS	<i>Exxon Valdez</i> Oil Spill

FEAM	Fisheries Economic Assessment Model
FJMC	Fisheries Joint Management Committee
FLIR	Forward Looking Infra-Red (FLIR) Imagery
FNOC	Fleet Numerical Oceanography Center
FY	Fiscal Year
GIS	Geographical Information Systems
GPS	Global Positioning System
GSA	General Services Administration
GUI	Graphical User Interface
IA	Interagency Agreement
IBR	Information Base Review
i.e.	that is
IMPLAN	Impact Analysis for Planning
IR	infrared
ITM	Information Transfer Meeting
IUM	Information Update Meeting
kHz	kiloHertz
km	kilometer
m	meter
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NAB	Northwest Arctic Borough
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NORM	normally occurring radioactive materials
NPDES	National Pollutant Discharge Elimination System
NPR-A	National Petroleum Reserve-Alaska
NRC	National Research Council
NSB	North Slope Borough
NSF	National Science Foundation
NSP	National Strategic Plan (MMS)
NTIS	National Technical Information Service
OCS	Outer Continental Shelf
OCSEAP	Outer Continental Shelf Environmental Assessment Program

OCSLA	Outer Continental Shelf Lands Act
OCSLAA	Outer Continental Shelf Lands Act as Amended
OMPA	Office of Marine Pollution Assessment
OSRA	Oil-Spill-Risk Analysis
OWM	Oil-Weathering Model
PAAM	Proposed Action and Alternatives Memorandum
PAH	polycyclic aromatic hydrocarbons
PC	personal computer
ppm	parts per million
RFIC	Request for Information and Comments
SPEM	Semi-Spectral Primitive Equation Model
TAG	Technical Assessment Group
TIMS	Technical Information Management System
TR	Technical Report
UAF	University of Alaska-Fairbanks
U.S.	United States
USDOC	U.S. Department of Commerce
USDOD	U.S. Department of Defense
USDOI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
U.S.S.R.	Union of Soviet Socialist Republics
WOSM	World Oil-Spill Model

Symbols

>	greater than
<	less than

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SECTION 1. Programmatic Overview

Background

The Alaska Environmental Studies Program (ESP) was initiated by the U.S. Department of the Interior (USDOI) in 1974 in response to the Federal Government's decision to propose areas of Alaska for offshore gas and oil development. Federal management of the Outer Continental Shelf (OCS) is guided by several legislative acts. Regulations implementing the OCS Lands Act (OCSLA) of 1953, as amended in 1978 (OCSLAA), designated the Bureau of Land Management (BLM) as the administrative agency responsible for leasing and the U.S. Geological Survey (USGS) as responsible for supervising classification, evaluation, development, and production of mineral resources on submerged Federal lands. The offices under BLM and USGS responsible for offshore leasing were reorganized as the Minerals Management Service (MMS) in 1982. One of the goals of the OCSLA was to provide for protection of the environment concomitant with mineral-resource development. The OCSLA requires the Secretary of the Interior to conduct environmental studies to obtain information pertinent to sound leasing decisions as well as to monitor the human, marine, and coastal environments (OCSLAA, 1978 [Public Law 95-372, Section 20]). Also, the National Environmental Policy Act (NEPA) of 1969 requires that all Federal Agencies use a systematic, interdisciplinary approach that will ensure the integrated use of the natural and social sciences in any planning and decision making that may have effects on the environment. Federal laws impose additional requirements on the offshore leasing process, including the Coastal Zone Management Act; Federal Water Pollution Control Act Amendments; Marine Mammal Protection Act (MMPA); Endangered Species Act (ESA); and Marine Protection, Research, and Sanctuaries Act.

The purpose of the ESP is to define information needs and implement studies to assist in predicting, projecting, assessing, and managing potential effects on the human, marine, and coastal environments of the OCS and coastal areas that may be affected by gas and oil development. Lease-management decisions are enhanced when current, pertinent, and timely information is available. To attain program goals, data on specific environmental, social, and economic concerns arising from offshore leasing are required. The ESP then monitors any effects during and after oil exploration and development. It is the largest, single-agency, mission-oriented, marine-studies program in the Federal Government. Since the ESP inception through Fiscal Year (FY) 1998, more than \$658 million have been spent on the ESP nationally, with more than \$260 million of this amount funding Alaskan studies in 14 planning areas in the Arctic, Bering Sea, and Gulf of Alaska Subregions (Figs. 1, 2, and 3).

Early in the development of the program, the focus was on obtaining baseline information on the vast biological resources and physical characteristics of the Alaskan environment for prelease decision making. These studies included biological surveys of marine species, basic oceanography and meteorology, and geologic and sea-ice phenomena. As a broader base of information was established, it became possible to focus on more topical studies in smaller areas

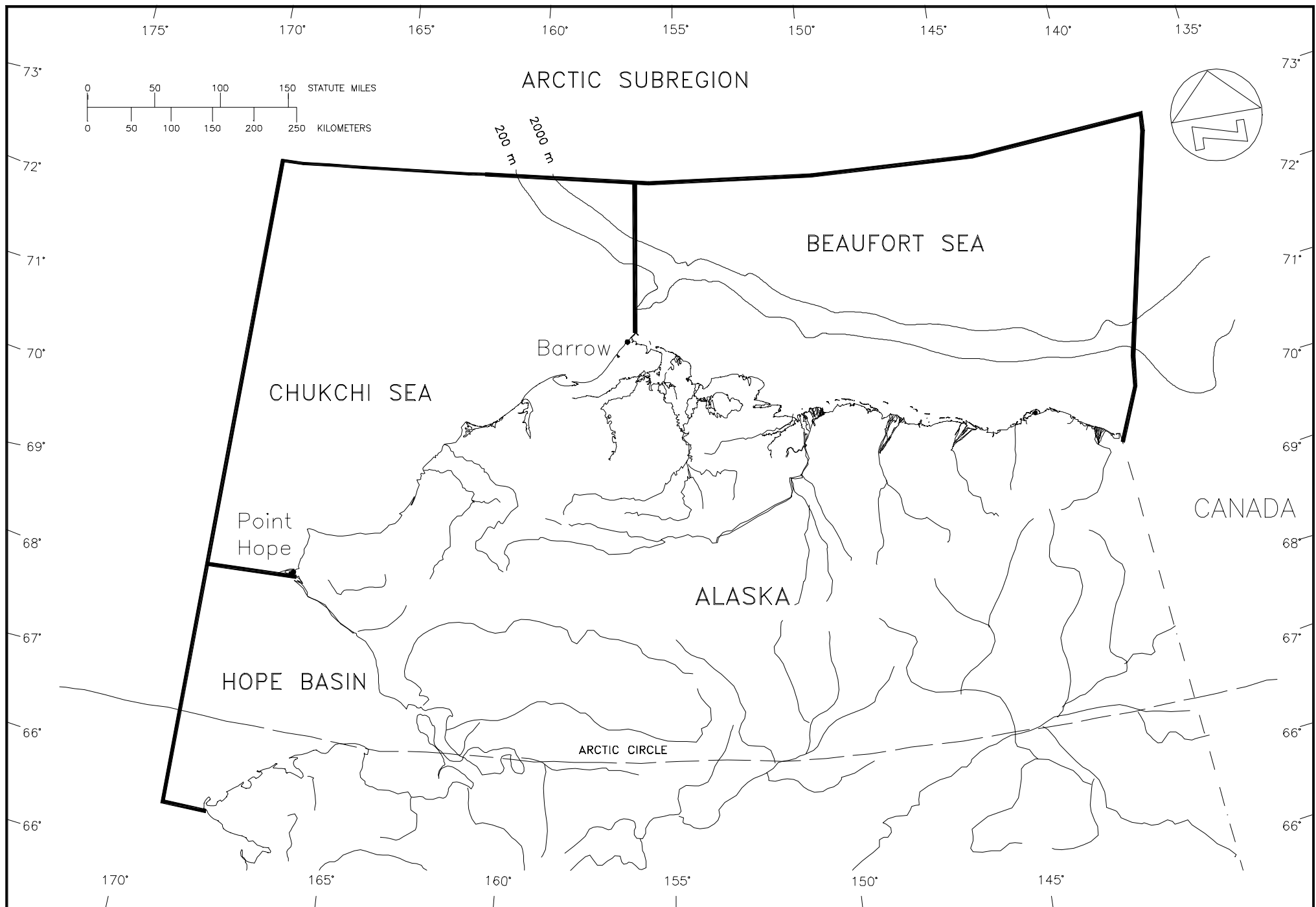


Figure 1. Planning Areas in the Arctic Subregion

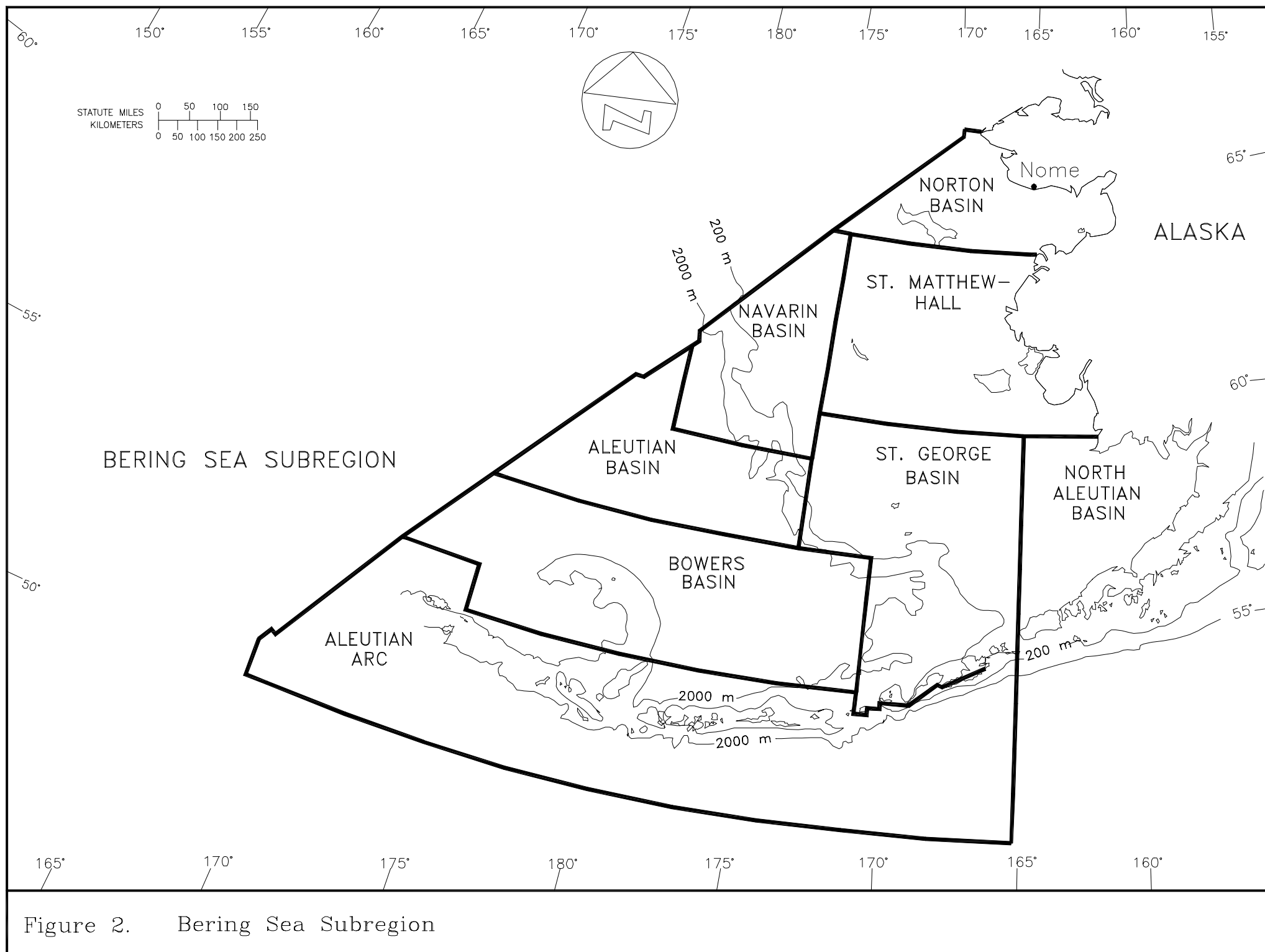


Figure 2. Bering Sea Subregion

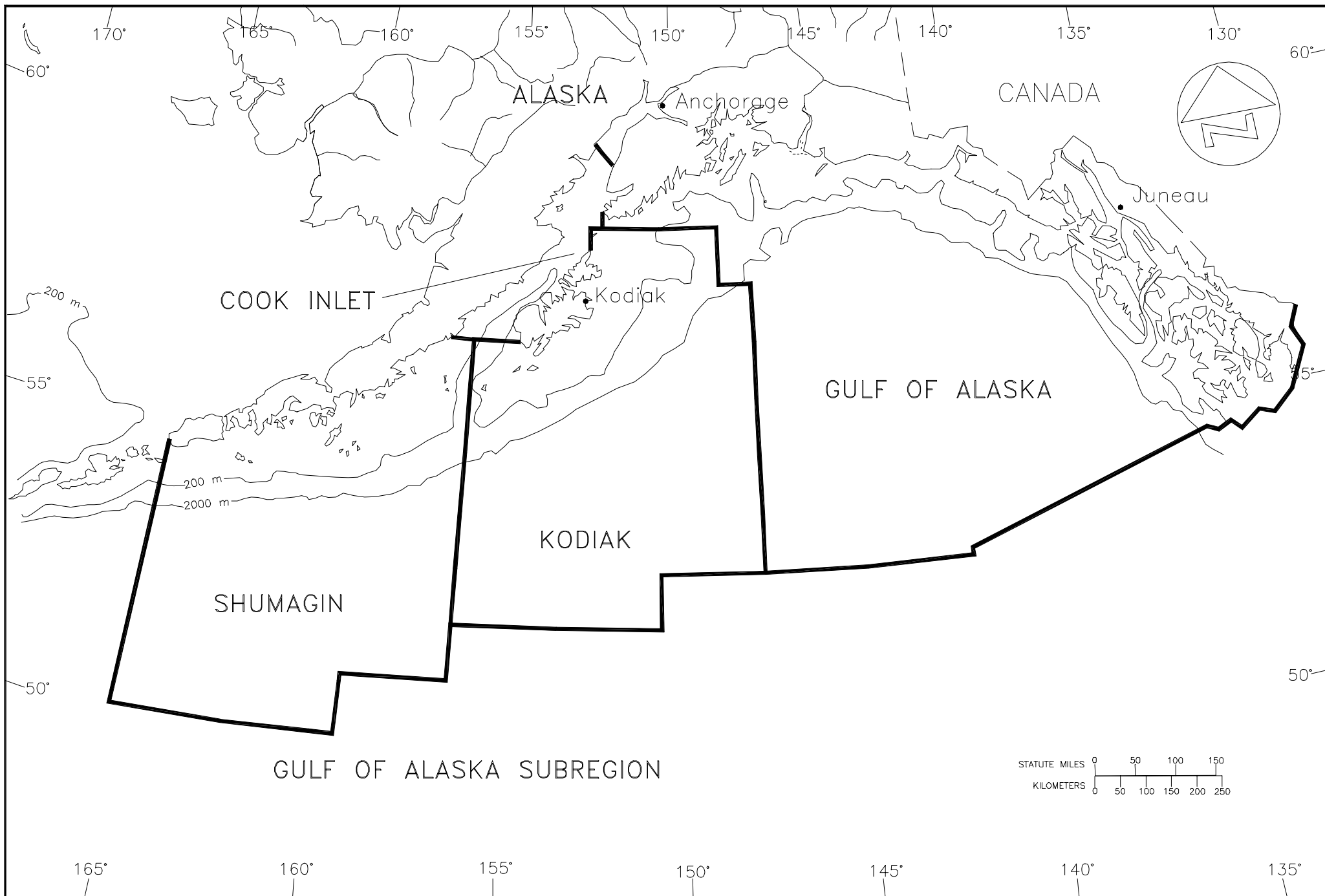


Figure 3. Planning Areas in the Gulf of Alaska Subregion

to answer specific questions and fill identified information needs. In addition, a number of generic studies were initiated on the potential effects of oil contamination on biological resource and on the probable transport and dispersion of oil that might be spilled in the marine environment.

The use of computer-modeling techniques has been implemented to aid in the assessment of potential oil-spill and other pollutant risks to the environment and to key species such as fur seals, sea otters, and endangered whales. Modeling also has been used in the ecosystem studies, especially where extrapolation to other areas seemed warranted.

As more disciplinary data were collected and analyzed, the importance of taking an integrated, interdisciplinary look at complete ecosystems in sensitive areas became apparent. During this time, the leasing program was maturing. As a number of sales were held and exploration activities began, postlease studies to monitor the possible effects of gas and oil activities on the environment and resources of these areas were initiated. The ESP provides information for development of the 5-year leasing schedule and for prelease- and lease-related decisions, and develops monitoring information necessary for postlease management.

As studies information has been amassed, improved focus has required greater integration of various scientific disciplines. The MMS has initiated Synthesis Meetings, Information Transfer Meetings (ITM's), and Information Update Meetings (IUM's) to gather maximum expertise and assess the status of existing information, and to plan the best possible approach to a study within the constraints of time and resources. As more pertinent information is collected by the MMS and other Federal and State Agencies, studies are funded to search and evaluate existing literature and data prior to initiation of field efforts. This prevents duplication of effort and saves valuable resources by focusing later study efforts on the areas of greatest information need and highest usefulness to MMS decision needs.

As noted by the National Research Council (NRC) (1994), the MMS Alaska ESP is "extensive, substantive and high quality." However, the Alaska ESP has been challenged to meet its mission in an increasingly conservative fiscal environment. For example, the ESP's funding declined significantly since 1986. Despite this challenging situation, the ESP, at the national level and in all the regions including Alaska, remains committed to attaining quality environmental and socioeconomic information.

The Alaska Annual Studies Plan (ASP) FY 2001-2002 complements and reinforces the Environmental Studies Program National Strategic Plan (NSP), 1998-2002. The NSP has several broad themes which include the following:

1. Monitoring Marine Environments
2. Seismic and Acoustic Impacts
3. Understanding Social and Economic Impacts
4. Oil-Spill research Techniques
5. Efficient and Effective Information Management

To be responsive to changing programs, issues, and offshore technologies, the Alaska ASP may propose studies which identify new or emerging issues and innovates in conjunction with the NSP themes. Due to the great differences existing between Alaska environments and other OCS areas, the uniqueness of the environment and related issues in Alaska underscores the need to be flexible in planning and implementation of needed studies.

Introduction and Strategy Review

Issues To Be Addressed

At each step of the offshore leasing and development process, a variety of potential issues or resource-use conflicts may be encountered. There are numerous issues and multiple-use conflicts related to offshore oil and gas development in Alaska. This section “Issues To Be Addressed” forms a framework for the section on “Identification of Information Needs”. As a result of issues characterized by uncertain information we identify specific Information Needs. Two questions are fundamental:

- (1) What is the expected change in the human, marine, and coastal environment due to offshore development and, therefore, expected change in benefits to humans from affected natural resources?
- (2) Can undesirable change be minimized by mitigating measures?

Environmental studies are often critical to answering both types of questions; and are expected to provide information useful to decision making in both regards. Currently the Alaska ESP has primary focus on upcoming developments, proposed lease sales, and existing leases in the Beaufort Sea and Cook Inlet regions.

Current offshore oil- and gas-related issues for which studies are proposed to address in the Beaufort Sea include but are not limited to:

- what long term changes in heavy metal and hydrocarbon contamination may occur near Beaufort Sea development prospects such as Liberty or regionally along the Beaufort Sea coast?
- what role will currents play in distribution of contaminants near development prospects?
- what long term changes in underwater industrial noise will occur and how might such noise propagate near development prospects?
- what are the effects of seismic exploration on the availability of bowhead whales for subsistence and other important marine species such as seals or fish?

- what changes might occur in habitat, distribution, abundance, and movement of key, potentially sensitive species such as bowhead whales, waterfowl, polar bears, other marine mammals, or fish?
- what interactions between human activities and the physical environment have affected these potentially sensitive species.
- what is the importance of future proposed or potential lease sale areas to feeding bowhead whales and overall bowhead population nutritional requirements?
- what potential contaminants are occurring in various sensitive species?
- what changes might occur in socioeconomics and subsistence lifestyles of coastal Alaska communities?
- what are current subsistence harvest patterns and what changes might occur in key social indicators as a result of offshore exploration and development?
- what changes might occur in sensitive benthic communities such as the Stefansson Sound “Boulder Patch”, other Beaufort Sea kelp communities or fish habitats?
- what refinements are there to our knowledge of major oceanographic and meteorological processes and how do they influence the human, marine, and coastal environment?
- how do we improve our projection of the fate of potential oil spills?
- if oil is spilled in broken ice, what will its fate be and how might it be cleaned up?
- what effects might pipeline construction have on nearby marine communities or organisms such as fish?
- how can we better integrate traditional knowledge of local residents into scientific processes and studies related to the Alaska ESP?

Similarly, there are a number of offshore oil- and gas-related issues that environmental studies in the Cook Inlet Region propose to address, including but not limited to:

- what long term changes in heavy metal and hydrocarbon contamination have occurred in water and sediment quality?
- what refinements are there to our knowledge of major oceanographic and meteorological processes in Cook Inlet and Shelikof Strait and how do they influence the human, marine, and coastal environment?

- how do we improve our prediction of the fate of potential oil spills?
- what long term changes related to past or future activities have occurred in marine food webs, especially regarding key fish, seabirds and sensitive marine mammals?
- what are the effects of offshore oil and gas exploration or development on important socioeconomic activities such as commercial fishing or existing community infrastructures?
- what are the near term and long term effects on key economic activities such as sport fisheries?
- what are current subsistence harvest patterns and what changes might occur in key social indicators as a result of offshore exploration and development?
- how can we better integrate traditional knowledge of local residents into scientific processes and studies related to the Alaska ESP?

As the FY 2003 to 2008 Five Year Offshore Oil & Gas Leasing Program is formulated, the Alaska ESP will consider issues identified in scoping and propose appropriate studies.

Participatory Planning

As proposals for exploration and development continue to evolve, Alaska's coastal communities on the Beaufort Sea are expecting increased involvement in project reviews and decisions that may affect their subsistence lifestyle. Since the people of Alaska's remote Arctic communities rely so heavily on subsistence resources of the marine environment, they are especially concerned about industrial activities that may directly or indirectly affect hunting success or the habitats of the species important to subsistence. In the same vein that local people expect to be involved in policy decision making, they also desire to participate in project-level decision making related to research activities that seek to understand the interactions of human activities and the natural environment.

Traditional knowledge has been incorporated into specific study planning, field work, and interpretation of results over the years of the ESP. It has been a continuing process to synthesize information from many projects into a broader, multi disciplinary view of research results. Past efforts such as MMS ITM's have helped us guide the design of future studies toward a more encompassing involvement of traditional information with scientific activities and results. Also of particular importance is the sharing of information between social and economic disciplines and other scientific fields. The process of melding traditional information with MMS scientific activities varies from project to project, but the outcome of better information for decision making is a common goal.

Over the years, the MMS ESP has involved Alaskans and others in its research planning and execution in a number of ways. Solicitation of comments on the Alaska Annual Studies Plans (ASP's) has been practiced for years. The MMS ESP has sought out and included the knowledge of coastal community residents in planning. Another key source of input is discussion and advice on the ASP by the MMS Scientific Committee, which occurs on an annual basis. Other public involvement, such as participation on study project-management-review boards or scientific-review boards of certain studies, has assisted the MMS. In all MMS field-oriented studies, researchers coordinate directly with local communities to discuss their plans, seek advice, and assure that interested people learn about the project and its results. Recently, the MMS has incorporated traditional knowledge of Alaskan residents directly in the preparation of its EIS's and decision documents.

Coordination and Cooperation

The Alaska ESP through its day-to-day operations and ASP process seeks to coordinate plans and ongoing studies with other ongoing programs and research to assure optimal studies management to reduce costs, enhance utilization of existing information, share logistics and equipment, and enhance team approaches to interdisciplinary projects. Currently a major portion of the program is conducted on a cooperative basis. In 1993, the MMS developed the Coastal Marine Institute (CMI) to take advantage of environmental scientific expertise at local levels. Under a 5-year Cooperative Agreement, the MMS committed \$1,000,000 per year for studies to be conducted by the CMI, if CMI can obtain matching funds. The Cooperative Agreement was renewed for another 5 years in 1998. The University of Alaska Fairbanks (UAF) School of Fisheries and Ocean Sciences, nationally recognized for its coastal and marine expertise, administers the CMI. In addition to funding CMI scientific research, a substantial portion of the MMS contribution supports education in Alaska by funding tuition and travel for UAF graduate-student research related to CMI projects.

Recently several other cooperative projects have been initiated including a cooperative agreement with Canadian entities to perform a study of tagging and tracking of beluga whales in the Beaufort Sea, a cooperative agreement with the Alaska Dept. of Fish and Game to jointly perform a multi year monitoring study of ringed seals in the Beaufort Sea, and a cooperative agreement with the Alaska Dept. of Fish and Game to jointly perform a multi year study of social consequences of Alaska OCS Activities.

The Alaska ESP also coordinates with other U.S. and local research entities such as the National Science Foundation, Arctic Research Commission, USGS- Biological Resources Division, *Exxon Valdez* Oil Spill Trustee Council research program, North Slope Borough Department of Wildlife Management, National Research Council, Polar Research Board, Cook Inlet Regional Citizens Advisory Council, and industry programs. Additional international linkages with the Russian Academy of Sciences Institutes in Magadan and Vladivostok have also been established.

Recently, the U.S. and seven other Arctic nations voluntarily agreed to cooperate on an Arctic Environmental Protection Strategy (AEPS) which has evolved into the formation of the Arctic

Council in 1996. The Alaska ESP maintains contacts and coordination with Arctic Council activities, such as the Arctic Monitoring and Assessment Program (AMAP) and Conservation of Arctic Flora and Fauna (CAFF). The ESP provides information to these working groups through review of reports and plans, and helps to inform participants of available information sponsored by MMS. Further, specific studies which can coordinate and integrate with working group activities are identified and beneficial linkages facilitated.

Projected OCS Activities

Prelease Considerations

This Fiscal Year (FY) 2001-2002 Alaska ASP reflects consideration of the Proposed OCS Oil and Gas Leasing Program 1997-2002 for the design and management of the ongoing studies program. In a frontier region such as the Alaskan Arctic—with large and remote planning areas, potential environmental hazards associated with offshore activities, and still-developing technology required for hydrocarbon extraction, maximum lead time is necessary to conduct adequate environmental assessments.

Beaufort Sale 176 in the Arctic Subregion is the only lease sale on the proposed lease-sale schedule for the period 1997-2002, as updated. Chukchi Sea/Hope Basin Sale 183 in the Chukchi Sea and Hope Basin Planning Areas, Cook Inlet Sale 173 and Sale 179 in the Gulf of Alaska (Yakutat) have been deferred from the 1997-2002 Program. The Bering Sea Subregion has no proposed lease sales. (See Figs. 1, 2, and 3).

As the FY 2003 to 2008 Five Year Offshore Oil & Gas Program is formulated, the Alaska ESP will identify relevant prelease considerations and propose appropriate studies.

Preparation of the EIS is the most important part of the prelease process that requires environmental information. In particular, information is needed in time to prepare draft EIS's for proposed lease sales. Although much information exists for certain Alaska OCS lease areas, changing conditions and environments often lead to the need to update past studies so that EIS information is current and accurate.

Postlease Considerations

Prior to FY 1982, most studies of the Alaskan offshore were planned, conducted, and concluded before a sale was held to provide decision information for EIS's. However, it is apparent that not all information needs can be obtained prior to a sale. In accordance with mandates of Section 20(e) of the OCS Lands Act, as amended, postlease studies will be needed to address environmental concerns and monitoring related to specific developments. MMS will acquire additional information for development-and-production-phase environmental analyses. Thus, future study plans have become more closely related to development schedules and monitoring and evaluation needs rather than leasing schedules. The wide range of environmental conditions

from Cook Inlet to the Arctic and planning lead times must be accounted for in the process of formulating new studies for the ASP.

Postlease activities that raise issues and require environmental data and assessment are:

- Geophysical surveys
- Exploration drilling
- Development, construction, and production activity
- Oil Transportation, including pipelines and tankers
- Lease termination or expiration (platform abandonment)

To date, there has been no OCS development or production offshore of Alaska. However, exploration, artificial-island construction and abandonment, and unitization agreements (including suspension of leases) have occurred.

In the Beaufort Planning Area, there have been 688 tracts leased in seven OCS Lease Sales. There are currently 82 active leases. (Fig 4) Twenty nine exploratory wells have been drilled and nine were determined to be producible.

Beaufort Sea Planning Area Lease Sales

Sale BF - December 1979	Sale 71 - October 1982
Sale 87 - August 1984	Sale 97 - March 1988
Sale 124 - June 1991	Sale 144 - September 1996
Sale 170 - August 1998	

The Call for Information and Nominations for Beaufort Sea Lease Sale 176 were issued September 1999 and is scheduled to occur in early 2002.

The British Petroleum Exploration Alaska (BPXA) Northstar development project is located about 10 miles north of Prudhoe Bay at Seal Island.(Fig. 4) While the Northstar Island is in State waters, 6 to 7 wells will be on the OCS. The project was approved by the U.S. Army Corp of Engineers May 1999 and by MMS September 1999. Construction of the gravel island is scheduled to start in the winter of 2000. The first production is expected in 2001. Recoverable reserves are estimated at 158 million barrels of oil, with peak daily production estimated at 65,000 barrels per day.

A second BPXA proposed project is the Liberty Unit in Foggy Island Bay. (Fig. 4) It is located about 6 miles east of the State Endicott Project. MMS is writing the Environmental Impact Statement for the project. Recoverable reserves are estimated at 120 million barrels of oil. If the

proposed project stays on schedule and is approved, construction could start in 2001, with the first oil production in 2003.

The Sandpiper Unit is located west of Seal Island. It is currently under suspension of operation because of uneconomic market conditions.

The only other active leases are in the Cook Inlet Planning Area. Cook Inlet Lease Sale 149 was held in June 1997 and generated two leases. (Fig. 5)

There are no active leases from previous lease sales in the Chukchi Sea or Hope Basin portions of the Arctic Subregion, or in the Bering Sea or Gulf of Alaska Subregions (see Figs. 1, 2, and 3).

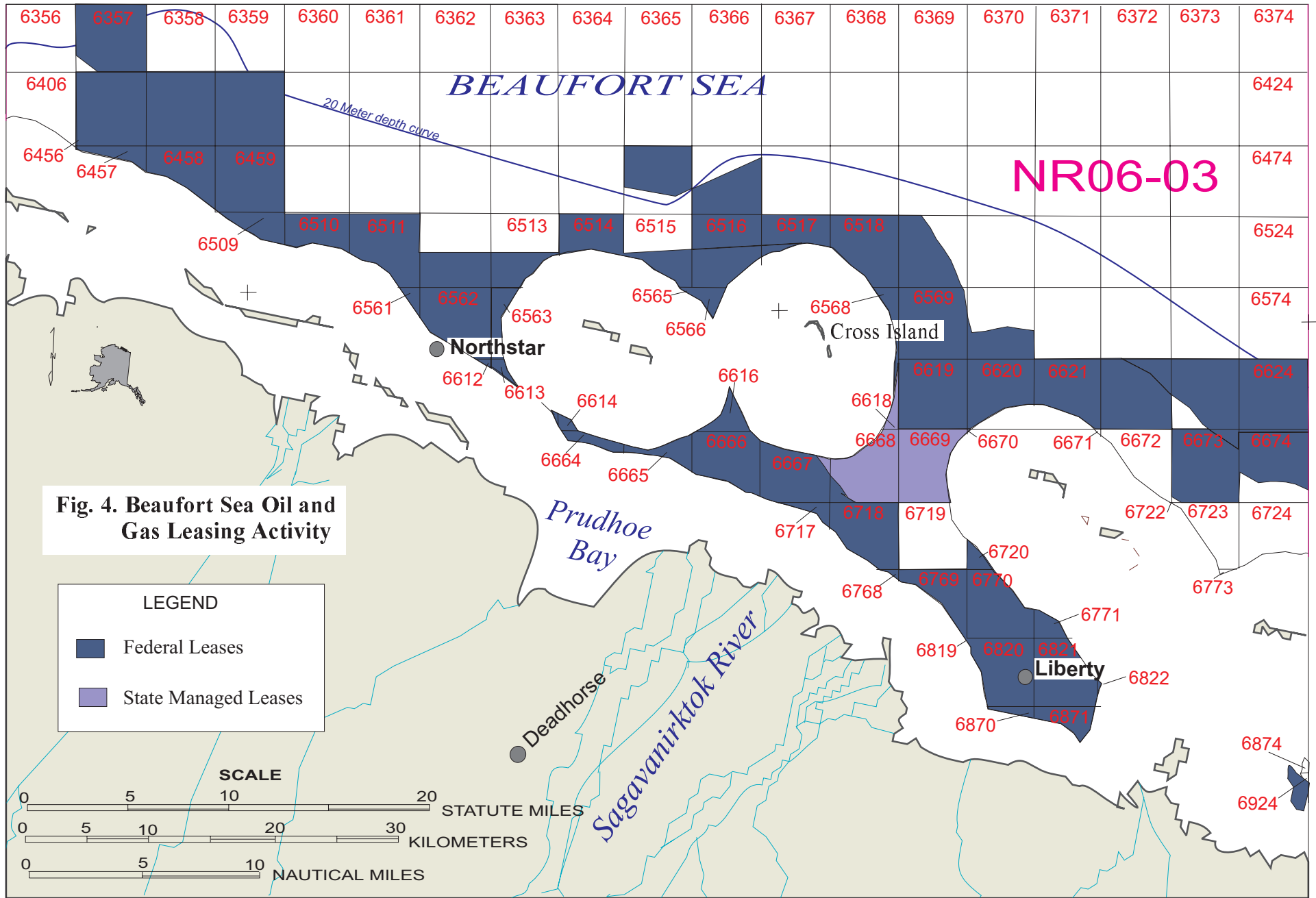
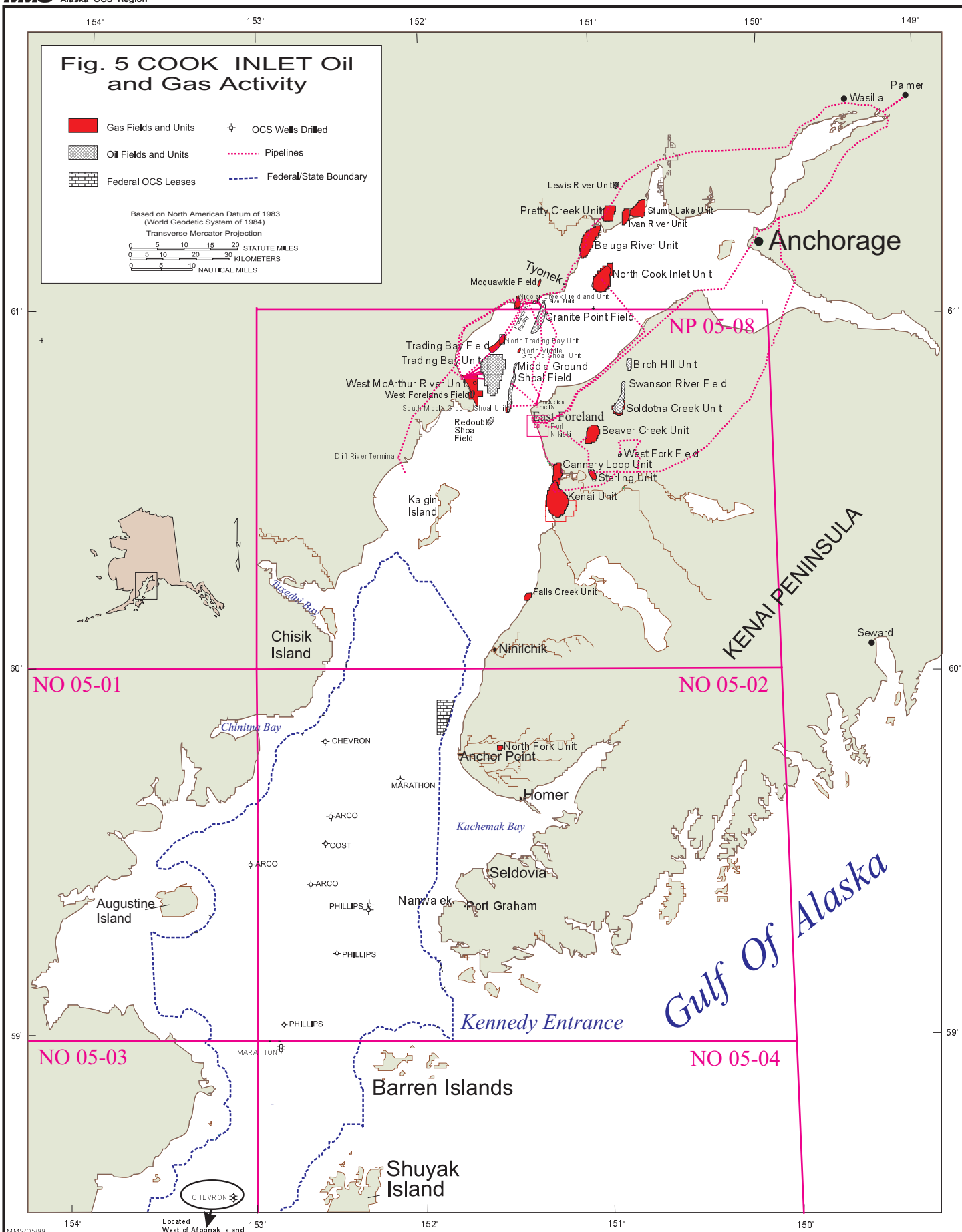


Fig. 5 COOK INLET Oil and Gas Activity

- | | |
|---|---|
| Gas Fields and Units | OCS Wells Drilled |
| Oil Fields and Units | Pipelines |
| Federal OCS Leases | Federal/State Boundary |

Based on North American Datum of 1983
(World Geodetic System of 1984)
Transverse Mercator Projection

0 5 10 15 20 STATUTE MILES
0 5 10 20 30 KILOMETERS
0 5 10 NAUTICAL MILES



Available Information

Introduction

In this section we present a reference to the extensive body of information currently available relevant to the issues facing the Alaska OCS Region.

The products of the studies are most commonly technical reports, scientific journal articles, data sets, and analytic models. Notice of the availability of these products is widely distributed to potentially interested parties. Anyone interested can contact MMS to have their name put on the mailing list for such notices. The Alaska Region web site, with further information on the Alaska ESP products can be accessed at <http://www.mms.gov/omm/alaska/ess/esshome.html>. The MMS Environmental Studies Program Information System is also accessible for abstract and document retrievals at <http://mmspub.mms.gov/espis>.

For all disciplines listed, a summary of MMS OCS research in USDO, MMS, Environmental Policy & Program Division, 1991. A bibliography of scientific journal articles based on MMS environmental research is in USDO, MMS, Environmental Studies Branch 1993

The Alaska ESP provides a variety of support functions in the areas of information transfer meetings, synthesis, workshops and publication. The ESP supports publication of study results in peer-reviewed literature. Hundreds of papers based on Alaska OCS studies have been published in scientific journals and books, and several hundred more in published conference proceedings. This improves both the quality of study reports and the distribution and availability of study results to a wide audience.

Physical Oceanography

The Alaska ESP has studied physical oceanography of the Alaska OCS Region as it relates to transport of contaminants and ecological processes. For the Arctic, ocean circulation models have recently been emphasized for the Beaufort Sea (Hedstrom, 1994; Hedstrom, Haidvogel, and Signorini, 1995; USDO, MMS, Alaska Region, 1999) and Chukchi Sea (Weingartner and Proshtinsky, 1998). Other modeling studies for the Arctic have tested, validated, or provided improved wind products fields to drive Arctic circulation models (UA, CMI, 1998; USDO, MMS, Alaska Region, 1999). One study is using circulation models to help evaluate changes in physical processes, such as multi-year reversals of the Beaufort gyre, related to interdecadal shifts in Arctic meteorology (USDO, MMS, Alaska Region, 1999). Another study has used a physical-biological numerical model to look at the processes involved in the vertical flux of primary production and convection along the Arctic ice edge (UA, CMI, 1998; USDO, MMS, Alaska Region, 1999).

Recent physical oceanographic measurements have been made in both Chukchi and Beaufort Sea Planning Areas, in conjunction with other Federal and international studies (Weingartner, 1998; UA, CMI, 1998; USDO, MMS, Alaska Region, 1999). See also summaries in UA, CMI,

1994, 1995, 1996, 1997; Becker, 1987, 1988; Hale, 1987; Norton and Sackinger, 1981; Hameedi and Naidu, 1988; Hurwitz, 1991; NRC, 1993, 1994; Truett, 1984; USDOC, NOAA 1978; USDOI, MMS, Alaska OCS Region, 1998a,b, 1990, 1993, 1996a.

In Cook Inlet, the ESP has mapped rip tides using remote sensing and local knowledge (USDOI, MMS, Alaska Region, 1999); also see summaries in: Hurwitz, 1991; NRC, 1990, 1993, 1994; USDOC, NOAA, 1989; USDOI, MMS, Alaska Region, 1992.

Fate and Effects

The Alaska ESP has emphasized both general and site-specific fate and effects studies in the Alaska OCS Region. The state of the art in oil spill weathering models has been recently evaluated and the MMS Coastal Zone Oil Spill Model has been improved and updated to a Windows/Arcview environment (Howlett, 1998; Reed et. al., 1998; USDOI, MMS, Alaska OCS Region, 1998). See also summaries in Hale, 1987; Hurwitz, 1991; Norton and Sackinger, 1989; Truett, 1984; USDOC, NOAA, 1989; USDOI, MMS, Alaska OCS Region, 1985, 1998a, 1992, 1993; USDOI, MMS, Offshore Environmental Assessment Division, 1991.

Sediment quality as related to oil and gas contaminants has been recently evaluated at least locally in all Alaska planning areas of current MMS interest. Most recent studies include evaluation of historical changes in trace metals and hydrocarbons in the Inner Shelf Sediments, Beaufort Sea, prior and subsequent to petroleum-related industrial development (UA, CMI, 1998 and USDOI, MMS, Alaska OCS Region, 1999), current water and sediment quality in Cook Inlet (Segar et al., 1995) and sediment quality in depositional areas of Shelikof Strait and Lower Cook Inlet (Boehm, 1997; USDOI, MMS, Alaska OCS Region, 1999). See also summaries in Becker, 1987, 1988; Geiselman and Mitchell, 1991; Hameedi and Naidu, 1988; Houghton, Segar, and Zeh, 1984; Hurwitz, 1991; Norton and Sackinger, 1989; Truett, 1984; USDOC, NOAA 1978, 1989; USDOI, MMS, Alaska OCS Region, 1998a, 1992, 1996a.

The Alaska ESP has examined in detail the interactions between Alaskan marine sediments and petroleum hydrocarbons in multiple, related laboratory studies (Henrichs, Luoma, and Smith, 1997; Braddock and Richter, 1997; Shaw and Terschak, 1998). See also summaries in UA, CMI (1994, 1995, 1996, 1997, 1998) and USDOI, MMS, Alaska OCS Region (1999).

Biology

The Alaska ESP has investigated the life history, food habits, abundance and distribution of fish, seabirds and waterfowl, as well as aspects of their interaction with oil and gas activities. Studies of nearshore-fish populations and their habitats have been conducted in Cook Inlet (e.g. Norcross, et al., 1997; Fechhelm, et al., 1999; Holladay, et al., 1999; also see summaries in: UA, CMI, 1994, 1995, 1996, 1997, 1998; USDOC, NOAA, 1989; USDOI, MMS, Alaska OCS Region, 1999) and in the Beaufort Sea (Becker, 1987; Houghton, et al., 1984; Hurwitz, 1991; Norton and Sackinger, 1981; USDOC, NOAA, 1978; also see summaries in ITM Proceedings

and MMS, OCS workshops: USDOl, MMS, Alaska OCS Region, 1988, 1990, 1993, 1996a, 1997a, 1998, 1999).

Fish species living in the Beaufort sea include Arctic char, whitefish, cisco, cod, smelt, flatfish, and sculpin. An extensive Arctic Fisheries Database on these fishes has been compiled from various OCS Environmental Assessment Program (OCSEAP) and MMS studies and placed on a compact disk (Bacon, Carns and Shuler, 1993). A catalog of waters important for spawning, rearing or migration of anadromous fishes is in State of Alaska, Department of Fish and Game, 1997. Fisheries enhancement investigations in North Slope oilfields are in Hemming, 1995. Fish surveys of selected Arctic coastal streams is in Hemming, 1996. Additional information on Arctic fishes is in Reynolds, 1997.

Major studies of seabirds have been completed, including population studies, reproductive ecology and trophics of marine birds of the Gulf of Alaska/Cook Inlet (Aglar, et al., 1994, Slater, et al., 1995; Piatt, 1993; see also discussions in USDOE, MMS 1996a; 1999). Studies of aspects of the life history, food habits, abundance and distribution of seabirds and waterfowl have been conducted in areas of the Beaufort Sea. Various studies are summarized and discussed in a variety of symposium and synthesis documents (e.g., Becker, 1987; Hurwitz, 1991; Johnson and Herter, 1989; Norton and Sackinger, 1981; USDOC, NOAA, 1978, 1989; USDOl, MMS, Alaska OCS Region, 1990, 1993, 1996a, 1997a, 1999).

Major ecosystem studies have been conducted in several areas of the Alaska OCS that are relevant to ongoing or proposed studies. Areas identified as important habitats for major Alaskan species, potential oil- and gas-development sites, and important subsistence-harvest areas have led to studies in Simpson Lagoon, the eastern Beaufort Sea, Peard Bay, Kasegaluk Lagoon.

Information on arctic kelp and the “Boulder Patch” (a unique benthic habitat in Stefansson Sound) are in USDOl, MMS, Alaska OCS Region, 1998.

Protected Species

This category includes all marine mammals, which are protected under the MMPA of 1972, and wildlife species protected under the Endangered Species Act of 1978. Marine mammals in the Beaufort Sea include bowhead, gray, and beluga whales; bearded, ringed, spotted, and ribbon seals; walrus; and polar bear. Recently completed and proposed new MMS OCS studies in the Beaufort focus on bowhead and beluga whales, the ringed seal and polar bear.

Since 1979, the Alaska OCS Region has monitored the status of the bowhead whale population through a time series of aerial surveys and behavioral studies. Much of the research on the bowhead whale was summarized and published in the peer-reviewed, hardcover *Bowhead Whale Book* (Burns, Montague, and Cowles, 1993). Updates of the MMS in-house bowhead whale aerial survey project (BWASP) are available in Treacy, 1993, 1994, 1995, 1996, 1997, 1998. The effects of ambient noise from oil and gas exploration and other potential anthropogenic

disturbances on the behavior of bowhead whales have been the subject of study in recent years (e.g. Richardson, et al., 1995; USDOl, MMS, Alaska OCS Region, 1997b). Various studies of the distribution, abundance and behavior of bowhead whales have been presented or summarized in numerous documents (Becker, 1987; Houghton, Segar and Zela, 1984; Hurwitz, 1991; Lentfer, 1988; Richardson, et al., 1995, Marine Mammal Commission, 1990, 1991, 1992, 1993, 1994, 1996; USDOC, NOAA, 1978, 1989; USDOl, MMS, Alaska OCS Region, 1990, 1992, 1996a, 1997b, 1999).

The distribution and abundance of beluga whales in the Beaufort Sea has been the subject of recent investigations (Richard, et al., 1997; Treacy, 1993, 1994, 1995, 1996, 1997, 1998). Richard, et al. (1998) recently completed a study of the movements and dive behavior of beluga whales in the Beaufort using satellite telemetry. The winter distribution of beluga whales in Cook Inlet was recently documented (Hansen and Hubbard, 1999). Other information about and/or studies of beluga whales can be found in (Becker, 1987, 1988; USDOC, NOAA, 1989; Norton and Sackinger, 1981; Marine Mammal Commission, 1990, 1991, 1992, 1993, 1994, 1996; NRC, 1994; USDOC, NOAA, 1978; USDOl, MMS, Alaska OCS Region 1990, 1993, 1996a, 1999).

The distribution, abundance and behavior of ringed seals in the Beaufort Sea has been the subject of numerous investigations, summaries of which can be found in various reports, syntheses and proceedings (Becker, 1987, 1988; Hale, 1987; Hurwitz, 1991; Norton and Sackinger, 1981, Marine Mammal Commission, 1990, 1991, 1992, 1993, 1994, 1996; NRC, 1994; UA, CMI, 1998; USDOC, NOAA, 1978; USDOl, MMS, Alaska OCS Region, 1988, 1996a, 1999).

The individual movements, distribution and abundance of polar bears in the Beaufort Sea have been researched for a number of years but detailed information about individual behavior is mostly limited to adult females because of the inability of researchers to attach radio-transmitter collars to adult male and juvenile bears. Existing information of polar bear distribution, abundance, natural history, behavior and population demographics can be found in: Amstrup and Wiig (1988); Derocher, et al., 1997; Lentfer, 1988; Truett, 1993; Marine Mammal Commission, 1990, 1991, 1992, 1993, 1994, 1996; NRC, 1992, 1994; and various synthesis documents and proceedings (USDOl, MMS, Alaska OCS Region, 1990, 1993, 1996a, 1997a, 1999).

Spectacled eiders occupy Arctic coastal and offshore habitats during spring migration and postbreeding/fall-migration periods, when they move west and south to their as-yet-poorly defined wintering areas, probably in the Bering Sea region. Satellite-tag-monitoring studies are gradually revealing the location of these areas. Steller's eiders also may be found in these areas during migration. Limited information on the distribution, behavior and movements of the endangered spectacled eider and its congeners can be found in Houghton, Segar and Zeh, 1984, and synthesis and ITM documents (USDOl, MMS, Alaska OCS Region, 1996a, 1997a, 1999).

Social and Economic Sciences

Subsistence is the predominant sociocultural issue. Several extensive studies have been completed on various aspects of subsistence and different subsistence species in the Arctic Subregion. Traditional knowledge has been incorporated into many specific studies including the study planning, field work, and interpretation of results over the years of the ESP. The Alaska ESP has sponsored more than 160 social and economic studies, many of which directly incorporate traditional and local knowledge as well as information based on survey interviews with local residents. Studies that acquire time-series data designed to correspond to very specific MMS requirements have been conducted. Recent socioeconomic studies are highlighted below.

In recent years there has been an increase in documentation of traditional knowledge on subsistence and subsistence lifestyle in the Alaska arctic. For example, Brower and Napageak (USDOI, MMS, 1997a) documented their perspective on subsistence in a recent symposium. Information from whale hunters on effects of seismic exploration on bowhead whale hunting and whale behavior is also summarized in MMS, USDOI 1997b. North Slope subsistence harvest has also been analyzed in detail in two recent reports (Braund, 1993a, 1993b). The analysis includes amounts of subsistence resource harvest estimates by species in Barrow and Wainwright in the 1987 to 1989 period. The estimates are based on detailed interviews. Maps of harvest areas are included. These data form important baseline information.

A series of studies between 1988 and 1992 using social indicators as measures of local community and regional well-being was completed in 1996. This series provides data that can be used as a baseline to detect and describe future social, cultural and economic changes of Alaskan coastal villages. The villages studied include many on the North Slope and Cook Inlet. Also studied were villages impacted by the *Exxon Valdez* oil spill in 1989 and other coastal villages which could be used as future study controls. (Human Relation Area Files, Inc. 1992a, 1992b, 1993a, 1993b, 1994a, 1994b, 1994c).

A peer review workshop on social indicators monitoring studies was held in 1996. The intent of the workshop was first to determine how to best use the series of social indicators studies identified above as well as similar earlier studies; and, second, to recommend future directions of social indicators monitoring. Social scientists who conducted the studies, technical reviewers of the studies and other knowledgeable social scientists participated in the workshop (USDOI, MMS Alaska OCS Region, 1996b).

An investigation of the effects on subsistence uses of fish and wildlife in coastal villages affected by the *Exxon Valdez* oil spill documents observations by Native subsistence hunters and gatherers. Face-to-face interviews on resource harvests and social and community organization were conducted in 1992, 1993, and 1994. The study showed changing perceptions and attitudes about effects of the spill over those three years. The study includes control or reference communities in the Arctic Subregion to strengthen application of findings to broad questions of sociocultural change. (Fall and Utermohle, 1995a, 1995b, 1995c, 1995d, 1995e, 1995f).

The *Exxon Valdez* oil spill itself, the cleanup and the litigation (which now exceeds a decade) have collectively caused a variety of social impacts. A report completed in 1998 analyzes the impacts by selected social factors and provides an annotated bibliography and abstracts of the wide body of literature related to these impacts (Impact Assessment, Inc., 1998).

Reasons for migration of Inupiat of the North Slope and oil industry employment of the Alaska North Slope Natives are analyzed in a report completed in 1993 (Institute for Social and Economic Research, 1993). This report is an important documentation of the low participation rate of Alaska North Slope Natives in the oil industry on the North Slope.

Commercial fishing data from the early 1980's to the early 1990's and a forecast model which can be updated with current data for the Gulf of Alaska including Cook Inlet is in a report completed in 1994. The report includes all important commercial harvest species. (Northern Economics, 1994). A variety of other socioeconomic, economic, and sociocultural information is reported and synthesized in documents reporting ITM's and synthesis meetings and workshops (Becker, 1987, 1988; Geiselman and Mitchell, 1991; UA, CMI, 1997, 1998; USDOC, NOAA, 1989; USDOl, MMS, Alaska OCS Region 1990, 1992, 1993, 1995, 1997a, 1999; USDOl, MMS, Environmental Policy and Programs Division, 1991; USDOl, MMS Environmental Studies Branch, 1993).

Other

Data management and archival are an integral part of the ESP. Physical and biological field data are digitized into standardized formats for submission to a national archive. Once stored, data from multiple projects can be merged for subsequent retrieval by subject or area (e.g., Bacon, Carns, and Shuler, 1993).

Identification of Information Needs

A letter was distributed to approximately 200 Federal, State, local, environmental, Native, industry, international, and other organizations in April 1999 requesting suggestions for new studies for the FY 2001-2002 ASP. Meetings were held in June, 1999 in Barrow and Kaktovik, and in October, 1999 in Nuiqsut with representatives of key organizations to discuss the ASP and possible new study concepts. Comments received from respondents were taken into consideration in identifying needed studies. Previous program reviews also were considered. In addition, suggestions for new studies were requested from all components of the Alaska OCS Region staff.

The ESP also relies heavily on information needs identified through solicitation of public comment and suggestions on how to enhance our information base at information transfer meetings (ITM) and other meetings. For example an ITM was held in January, 1999. Approximately 1,000 invitations for the ITM were sent to State and Federal Agencies; borough, city, and village leaders; oil and fishing industry personnel; environmental groups; scientists; contractors; and others. Approximately 200 people, including about 30 MMS personnel,

attended various sessions. Attendees were encouraged by session chairs to comment on the information available, either through oral participation in the question-and-answer periods during the ITM, or afterwards in writing.

Several of the approved and proposed studies address recommendations from Cook Inlet communities and the Cook Inlet Regional Citizens Advisory Council (CIRCAC); and a few of the proposed studies also were highlighted in previous ESP plans.

Some of the studies address recommendations from the NRC in a recent review of the Alaska ESP. The review is entitled “Environmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaska” (NRC, 1994). The NRC report was prepared in response to a request from the U.S. House of Representatives that MMS seek NRC advice about the adequacy of environmental information for Beaufort Sea lease sales. The NRC committee concluded that the environmental information currently available for the Beaufort Sea OCS area is generally adequate for leasing and exploration decisions, except with regard to effects on the human environment (NRC, 1994: Executive Summary, p. 3).

Consideration was also given to a series of reviews of the national ESP by the NRC within the National Academy of Sciences. The reviews are entitled “Assessment of the U.S. Outer Continental Shelf Environmental Studies Program.” Volume I focuses on Physical Oceanography (NRC, 1990), Volume II on Ecology (NRC, 1992*a*), and Volume III on Social and Economic Sciences (NRC, 1992*b*); Volume IV summarizes Lessons and Opportunities (NRC, 1993).

Although the NRC (1994) concluded that the ESP in Alaska is generally extensive, substantive, and of high quality, the lack of data about effects on the human environment was considered a major information need for Alaskan leasing and exploration decisions. The NRC recommended documenting more carefully the changes in the human environment that result from all phases of Federal actions on the OCS.

In addition, the NRC review mentioned the importance of documenting long-term, gradual sociocultural changes from all phases of OCS activities. The NRC also recommended the careful quantification and analysis—and inclusion of scientific conclusions—in social and cultural assessments. Proposed socioeconomic studies would further meet this recommendation.

Beaufort Sea General Information Needs

Long-Range Monitoring of Interdependent Physical, Biological, and Social Processes:

Both offshore and onshore oil and gas development and production activities are increasing across Alaska’s North Slope. Residents of Nuiqsut, Kaktovik and Barrow are particularly concerned about long term effects of offshore developments at Liberty and Northstar as well as long term effects of any development from OCS Lease Sales 170 and 176. Interagency reviews of related EIS’s and Development and Production Plans are expected to lead to additional

recommendations for monitoring impacts of Northstar and Liberty. Key constituents have identified the need to monitor under ice currents, sedimentation, underwater noise, and potential effects on social systems/subsistence in the vicinity of Liberty and Northstar developments. Related questions that need addressed are the characteristics of major oceanographic and meteorological processes and how they influence the human, marine and coastal environment.

Information on Bowhead Whales and Other Wildlife: Bowhead whales are heavily relied upon by Inupiat whale hunters for subsistence and are central to village cultural and spiritual life. Whale hunters have observed that migrating bowhead whales deflect from their normal migratory route well upstream of active seismic vessels and divert their migration route far offshore. They contend that deflection around oil- and gas-industry activity (including drilling activity and associated icebreaker support) forces whales farther and farther offshore, making them harder and more dangerous to hunt. They also are concerned that whales may avoid traditional feeding grounds and concerned as to the extent to which certain areas are important feeding grounds for migrating bowhead whales.

These concerns are addressed in part by ongoing studies such as the MMS Bowhead Whale Aerial Survey Project (BWASP) and ongoing study titled “Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information.” Also, a study currently under contract titled “Reference Manual and GIS Geospatial Database of Oil Industry and other Human Activity (1979-1998)” is collecting information on past human activities in the Beaufort Sea and will provide this information to proposed future studies. Analysis of this information for covariance of human activities and sea ice in relation to fall migrations of bowhead whales will be needed

The populations of bowhead whales, polar bears, beluga whales, spectacled eiders, and other endangered species are an ongoing concern of environmental groups, Federal agencies, and the International Whaling Commission. North Slope villages are particularly concerned about potential disturbance of ringed seals, waterfowl, and other subsistence-wildlife species by oil-industry activities such as helicopter overflights

Native Culture: The Inupiat feel that their culture is vulnerable to effects from petroleum-development activities. Petroleum activities might lead to social disruption and a change in cultural values through population shifts (emigration of large numbers of non-Inupiat to the North Slope), employment changes (further displacement of the subsistence lifestyle by a cash economy), cumulative effects of multiple industrial activities, and alteration of subsistence-harvest patterns. The anticipated decline in oil revenues to the North Slope Borough is an issue of concern to the Natives also.

The Inupiat rely on a wide variety of marine resources as significant sources of food. In addition, the harvesting, sharing, and consuming of subsistence resources form an important part of the traditional Inupiaq culture and spiritual life. The Inupiat are concerned that a temporary or permanent elimination of primary subsistence foods would cause North Slope residents either to shift to less desired subsistence resources or to replace subsistence foods with expensive Western

foods. There is a need to monitor potential key indicators of socioeconomic and cultural changes of communications on the North Slope.

Another concern is the use of traditional Inupiaq knowledge in analysis of potential environmental effects; mitigation measures to protect environmental resources; and general offshore planning, leasing, and regulation of industry activity. We should continue to recognize, and include firsthand knowledge of local subsistence hunters to augment the Western-science knowledge base.

Pollutants: North Slope villagers are concerned about any potential contamination of their food supply. In the Beaufort Sea, such foods include bowhead whales, seals, waterfowl, and fish. Of particular concern is the fate, behavior, and cleanup of a major oil spill and the potential mortality to marine wildlife in open water or effects resulting from entrainment of oil in sea ice. Other oil- and gas-industry activities are perceived to pose a threat of contamination through drilling mud disposal. Related to these concerns, additional information is needed regarding currents carrying oil under ice. The most current information on climate and ice is important to addressing these concerns.

Small portions of the Beaufort sea floor near the Liberty development unit have a special benthic environment referred to as the “kelp community” or the “Boulder Patch.” This unique environment could be negatively affected by sediments or pollutants associated with oil- and gas-industry activities.

Cook Inlet General Information Needs

Physical Oceanography: The MMS Oil Spill Risk Assessment (OSRA) Model needs additional validation in Alaskan waters. A way to verify the OSRA is to deploy satellite-tracked drifters to measure surface currents. A few modest studies have been performed on surface currents in Cook Inlet. But more extensive information is needed particularly in middle and upper Cook Inlet.

Protected Species: Beluga whales are vulnerable to potential oil spills in Cook Inlet. Noise from vessel traffic associated with oil development activities may temporarily disturb and displace belugas from preferred habitat areas. Additional information is needed to determine areas of Cook Inlet important to beluga whales during winter months to supplement information collected in 1997.

Information Access: Most of the common problems facing the public, researchers, and managers in Cook inlet is the poor understanding of the research needs, and public understanding of what numerous agencies are doing. A multi-agency tracking system of ongoing research in Cook Inlet and its watershed will help MMS focus funding decisions.

Topical Areas for FY 2002

This section presents a general forecast of significant topical issues and concerns to be addressed by proposed studies for FY 2002 and beyond. In general, these topics conform with the research themes of the NSP. Due to the great differences existing between Alaska environments and other OCS areas, the uniqueness of issues in Alaska have dictated the need to anticipate new topical areas for needed implementation within the Alaska ESP. These projects will focus on MMS mission needs within the context of increasing industrial development and potential trends in changing climates. Specific geographic emphases are likely to change due to potential changes in leasing or development schedules.

Most of the presently proposed studies for FY 2001 will continue into FY 2002 and address the topical areas described below. These will be re-assessed as part of the FY 2002-2003 planning process. A few studies included in this ASP will be recommended for initiation in FY 2001.

ARCTIC PLANNING AREAS

With offshore oil and gas activity moving into the development phase in the Northstar and Liberty projects it will be important to continue monitoring studies and other priority studies of key species and marine communities. Monitoring of bowhead whales will continue, and additional studies may be brought online which address ringed seals, kelp communities, fishes and migratory waterfowl. Studies will vary from description of behaviors and habitat to monitoring for changes. Additional studies of the physical environment such as current regimes and ice characteristics will be proposed to support interpretation of data from living resource investigations and to provide a better understanding of the fate and dispersion of OCS discharges.

MONITORING KEY SPECIES AND/OR MARINE COMMUNITIES IN THE BEAUFORT SEA AND INTEGRATION WITH PHYSICAL/SOCIAL STUDIES , WITH EMPHASES NEAR LIBERTY AND NORTHSTAR DEVELOPMENTS

Issue: What changes, if any, to current studies/strategies will be needed to monitor bowhead whales, ringed seals, kelp communities, fish, and waterfowl? What studies are needed to fully understand degree of change in these species habitats? How can these best be integrated with other disciplinary studies?

Issue: What changes will occur for potential overwintering fish habitat in gravel mines resulting from OCS development?

PHYSICAL OCEANOGRAPHIC UPDATES IN THE BEAUFORT SEA AND FOCUSED INVESTIGATIONS/INTEGRATION WITH LIVING RESOURCE STUDIES , WITH EMPHASES NEAR LIBERTY AND NORTHSTAR DEVELOPMENTS

Issue: What additional physical oceanography should the ASP address to assure appropriate regional context or localized measurements regarding parameters such as current regimes, water temperatures/salinity, ice characteristics. How should these

investigations be integrated with other ongoing studies and agencies/research concerned with climate change?

CONTAMINANT UPDATES IN THE BEAUFORT SEA WITH FOCUSED INTEGRATION WITH LIVING RESOURCE STUDIES

Issue: What changes to current monitoring strategies for heavy metal and hydrocarbon deposition in marine sediments or water is needed? How should these investigations be integrated with other ongoing studies?

SOCIAL AND ECONOMIC MONITORING: ALASKA ARCTIC COASTAL COMMUNITIES

Issue: What changes, if any, to ongoing social indicator monitoring will be needed for improved assessment and mitigation of impacts on key communities and parameters?

Issue: What information is needed to minimize impacts on archaeological resources and integrate archaeological investigations with studies of the physical environment?

Issue: How might localized effects on oceanographic or other environmental factors affect trends in subsistence activities and harvest?

UPDATED STATUS OF IMPORTANT ARCTIC SPECIES, MARINE COMMUNITIES AND ECOSYSTEMS FOR ENVIRONMENTAL IMPACT PREDICTION

Issue: In the context of potential long term climatic changes, how reliable is information from past studies on basic parameters for marine living resource abundance, seasonal movements, or ecosystem relationships? What are priority resources for updated investigations to assure accurate environmental assessment?

Issue: What potential diversion may occur of nearshore fish migration (particularly anadromous species such as Arctic Cisco) due to existing causeways, new structures or localized effects on oceanographic conditions? How might potential effects on fish migration impact subsistence fish harvest at Nuiqsut?

Issue: What changes in food web relationships for key seal species are occurring and how might those changes affect success of subsistence?

MELDING TRADITIONAL KNOWLEDGE INTO ENVIRONMENTAL STUDIES PLANNING AND IMPLEMENTATION; SYNTHESIZING TRADITIONAL KNOWLEDGE THRU TARGETED STUDIES

Issue: What new features should a government-managed environmental studies program adopt to facilitate and enhance the use of traditional knowledge? What traditional

knowledge can be synthesized to assist decision making? How can sharing of information between scientific and traditional sources be enhanced?

UPDATING BASELINE STUDY OF THE CULTURAL RESOURCE POTENTIAL OF THE BEAUFORT SEA

Issue: What baseline cultural resource information in the Beaufort Sea will be needed after studies of ice gouging and sea level change are completed?

SUB-ARCTIC PLANNING AREAS

MONITORING KEY SPECIES AND/OR MARINE COMMUNITIES IN COOK INLET, SHELIKOF STRAIT OR THE GULF OF ALASKA AND INTEGRATION WITH PHYSICAL/SOCIAL STUDIES

Issue: There has been no systematic determination of bioaccumulation in important marine animals. We know that some resources, including some herring stocks, crabs, shrimp, and a west-side bird colony are depleted in Cook Inlet, but not why. What changes, if any, to current studies/strategies will be needed for sensitive biota such as seabirds, marine mammals, fish or critical habitats? How can studies of key species or habitats best be integrated with other ongoing studies? How do OCS induced changes, if any, relate to observed declines in key species in the Bering Sea and Gulf of Alaska?

Issue: The effects of oil spills, discharged pollutants, and construction activities on lower-trophic-level organisms, particularly on intertidal shellfish, are a major concern in the Cook Inlet area. Cook Inlet has been described as a large bathtub—if an oil spill occurs, a black ring around the tub might result. The MMS OSRA for Cook Inlet supports this simile, and the MMS effects analysis indicates that intertidal shellfish resources would be at risk if a major oil spill occurred. The *Exxon Valdez* oil spill sensitized the Cook Inlet community to both the effects of oil spills and the general issue of bioaccumulation of pollutants by shellfish. What are ways to analyze this issue?

POTENTIAL OIL SPILLS A RISK TO FISH

Issue: Fish are the primary aquatic resource in Cook Inlet. The major risk to fish in Cook Inlet would be from potential oil spills. Salmon could be directly affected by an oil spill because the spill could alter their chemosensory detection required for migration orientation. If they are able to avoid a spill, their migration patterns and spawning timing could be altered depending on the size of the spill. Also, there could be some mortality to demersal and semidemersal fishes. Eggs and larval fish of intertidal spawners such as herring would be at risk from an oil spill and entire year-classes of these fish could be affected. The number and species of fishes affected would depend on the season, life stage of the fish (adult, juvenile, larval, or egg), and the length of contact. What are ways to analyze this issue and mitigate potential effects?

PHYSICAL OCEANOGRAPHIC UPDATES IN COOK INLET, SHELIKOF STRAIT OR THE GULF OF ALASKA AND FOCUSED INVESTIGATIONS/INTEGRATION WITH LIVING RESOURCE STUDIES

Issue: What additional physical oceanography should the ASP address to assure appropriate regional context or localized measurements regarding parameters such as current regimes, water temperatures/salinity, ice characteristics. How have physical parameters contributed to observed declines in key species in the Bering Sea and Gulf of Alaska? How should observations of the physical environment be integrated with other ongoing studies?

CONTAMINANT UPDATES IN COOK INLET, SHELIKOF STRAIT OR THE GULF OF ALASKA WITH FOCUSED INTEGRATION WITH LIVING RESOURCE STUDIES

Issue: Crude oil and fuels are tankered into and out of Cook Inlet. Discharges from existing oil and gas facilities in the State waters of Cook Inlet are anticipated to be grandfathered into the next general NPDES permit. Oil production in Cook Inlet, all from State leases, peaked in the 1970's and is on a down trend. Half of the State's population lives in the Cook Inlet watershed, and treated sewage from this population is discharged into the inlet or its rivers. Oil refineries, a natural-gas-export facility, an oil terminal, a major fertilizer plant, sewage-treatment plants, and fish-processing facilities are located on the Cook Inlet shoreline. However, there has been no systematic determination of contaminant loading in Cook Inlet, regional monitoring of water and sediment quality. What changes to current monitoring strategies for heavy metal and hydrocarbon deposition in marine sediments or water is needed? How should these investigations be integrated with other ongoing studies?

Issue: The oil industry has operated in Cook Inlet and has been allowed to discharge drilling muds and formation waters for 3 decades. Nationwide, the EPA has decided to prohibit such discharges in coastal waters, except in Cook Inlet, and in offshore waters within 3 miles of shore, except in Alaska. The Cook Inlet Exemption and the Alaska Exemption have been justified by EPA on the basis of local economics rather than on an environmental risk analysis. Proposed invoking of these two exemptions in a new proposed general National Pollution Discharge Elimination Systems (NPDES) permit for the offshore oil industry has intensified local concerns over existing and future water and sediment quality. Native villages in Cook Inlet have sued to enjoin the State of Alaska from agreeing to discharge allowances in the proposed NPDES permit. What are ways to analyze and resolve this issue?

SOCIAL AND ECONOMIC MONITORING: ALASKA COASTAL COMMUNITIES IN THE VICINITY OF COOK INLET, SHELIKOF STRAIT OR THE GULF OF ALASKA

Issue: Concerns about the potential effects of OCS activities on the local economy focus on gains and losses from oil spills and cleanup events, including commercial fishing, sport fishing, and subsistence harvests at the community level. Commercial fishing and sport fishing also could be affected by the reduced size of fishing areas. Subsistence-harvest patterns could be affected by industrial disturbance, including noise, construction activities, reduced access to resources, and increased population and industrial employment. Sociocultural systems could be affected by changes in social organization, traditions and cultural values, and subsistence harvests, and by increased stress on sociocultural systems. What changes, if any, to ongoing social indicator monitoring will be needed for improved assessment and mitigation of impacts on key communities and parameters? How have declines in key species in the Bering Sea and Gulf of Alaska affected subsistence in sub-arctic planning areas?

UPDATED STATUS OF IMPORTANT SUBARCTIC SPECIES, MARINE COMMUNITIES AND ECOSYSTEMS FOR ENVIRONMENTAL IMPACT PREDICTION

Issue: In the context of potential and ongoing long term climatic changes and ongoing declines in key species, how reliable is information from past studies on basic parameters for marine living resource abundances, seasonal movements, or ecosystem relationships? What are priority resources for updated investigations to assure accurate environmental assessment?

MELDING TRADITIONAL KNOWLEDGE INTO ENVIRONMENTAL STUDIES PLANNING AND IMPLEMENTATION; SYNTHESIZING TRADITIONAL KNOWLEDGE THRU TARGETED STUDIES

Issue: What new features should a government-managed environmental studies program adopt to facilitate and enhance the use of traditional knowledge? What traditional knowledge can be synthesized to assist decision making? How can sharing of information between scientific and traditional sources be enhanced?

MMS ENVIRONMENTAL DATABASE ARCTIC AND SUBARCTIC PLANNING AREAS

Issue: For both the Beaufort Sea and Cook Inlet there is a need to develop a corporate environmental database for the Alaska OCS Region and to compile the digital data that MMS has procured by contract over the years. How can we establish the database critical for the monitoring of new oil- and gas-development projects, for analyzing biological resources affected by input from the OSRA and for completing environmental analysis required by the NEPA in a timely manner? An internal MMS working group report supports establishment of such a database. This report, entitled "Report to the Offshore Environmental Management, Development of a Corporate Environmental Database" was completed in spring 1997.

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SECTION 2. STUDY PROFILES

Alaska Annual Studies Plan FY 2001-2002

Part A. Profiles of Approved Studies

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Circulation, Thermohaline Structure, and Cross-shelf Transport in the Alaskan Beaufort Sea

Actual Costs (in thousands)

FY1998 - \$623

Total Cost: \$623

Period of Performance: FY 1998-2001

Description:

Background Current, temperature, and salinity time series are largely unavailable for the Arctic Ocean, including the in the Alaskan Beaufort Sea. Forcing and time and space scales are hypothesized rather than identified and confirmed. There are high interannual differences in flow and coastal salinity, but insufficient data to decipher whether these differences are due to long term trends or just inherent variability. Although there is salinity, temperature, and other data available for the Arctic Ocean, there is only one full year of cross-shelf mooring data along the Alaskan Beaufort coast. Data from elsewhere in the Arctic Ocean indicate that the oceanographic state of the Arctic Ocean may have changed since the earlier study. This study will provide a second year of data.

Objectives The objectives of this study are to:

1. Determine the mean transport over the outer continental shelf and slope and the cross-shelf and vertical scales of the mean flow field.
2. Determine the magnitudes of transport variability and the dominant temporal and spatial scales associated with this variability.
3. Determine the relation between variations in temperature and salinity and variations in the flow field at time scales between the synoptic to the seasonal. Determine if changes in the baroclinic flow are consistent with changes in the cross-shelf density structure.
4. Determine the cross-shelf fluxes of heat, salt, and momentum. Determine if these are related to instabilities (eddy generation mechanisms) of the alongshore flow.
5. Determine the relationship between observed flow and density variations and the surface wind field.

6. Compare the results obtained from the proposed field program with those collected in 1987/88 in prior MMS research, to determine whether recent large changes in the Arctic Ocean are also reflected in the Beaufort Sea.
7. Combine this data set with other measurements recently acquired from around the Arctic Ocean to provide an updated synthesis that relates the Beaufort Sea to the large-scale circulation of the Arctic Ocean.

Methods Moored instruments are being deployed along the outer shelf and slope of the Alaskan Beaufort Sea for a period of one year. The mooring data will be supplemented by hydrographic profiles collected during the mooring deployment and recovery cruises on a cross-shelf transect along the 147° W meridian.

Products Data set, final report, and peer-reviewed publication.

Importance to MMS Understanding the physical oceanography of the Beaufort Sea is a necessary precursor to establishing accurate and reliable oil spill trajectory models. Results from such models are an important part of EIS analysis of proposed lease sales and choosing among alternatives. Oil-spill issues involving or resolvable by the trajectory model constitute half the public comments submitted on NEPA documents for decision-making on proposed offshore oil- and gas-lease sales on the Alaska OCS.

Date Information Required: Study results will be used for the proposed Beaufort Sea Sale in 2002. The data will also be useful in evaluating development plans being submitted for the Beaufort Sea.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Cook Inlet

Type: Contract

Title: Mapping of Cook Inlet Tide Rips Using Local Knowledge and Remote-Sensing Imagery Techniques

Actual Costs (in thousands)

Period of Performance: FY 1998-2000

FY1998 - \$128

Total Cost: \$128

Description:

Background Cook Inlet tide rips are strong tidal currents that occur along convergences between water masses in the inlet. A 1977 study by Burbank worked with local fishermen to map the Cook Inlet tide rips. Those areas were generalized on a large-scale map prior to the advent of the GPS. The tide rips concentrate oil within or along their margins; there are documented cases where spilled oil was seen to submerge at the convergences along the rips. Although this concentrating of spilled oil in Cook Inlet tide rips is well established from spill-case histories, neither this spill behavior nor the rips themselves are included in the MMS OSRA model for Cook Inlet. In addition, Cook Inlet fishermen concentrate their efforts in the rip tides because the fish concentrate in the rips. Cook Inlet fishing groups have asked MMS to develop deferral alternatives to exclude the tide rips from being leased, to avoid interference with the fishery. The MMS needs precise, ground-truthed information on the location of tide rips to locate such potential rip deferrals accurately or to develop alternative, rip-specific mitigation measures within lease blocks.

Objectives: The objectives of this study are to:

1. Learn the locations of tide rips fished by drift gill-netters in the OCS part of Cook Inlet during the commercial salmon season and how variable these locations are.
2. Find out how the location of tide rips change between years and seasons in all of Cook Inlet.
3. Collate and relate information on fishery use of rips, rip locations, and their variability to potential conflict with oil industry's operations.
4. Synthesize historical information, local knowledge, and scientific data for Cook Inlet on how rips affect spilled oil in the inlet.

Methods The methods of this study are:

1. Fishermen's workshops to gather local knowledge from Cook Inlet fishermen.
2. Collection and statistical analysis of current and historical satellite and aerial remote-sensing imagery of Cook Inlet tide rips.
3. Review and synthesis of literature and local information sources.

Products Presentation slides, outreach presentation, final report, peer-reviewed journal article, GIS data.

Importance to MMS Tide rips are known to concentrate oil spilled in Cook Inlet, and spilled oil tends to travel along—not across—rip boundaries. Current models are not capable of predicting rip tide locations and thus this phenomenon is not simulated in the MMS OSRA. The location of the tide rips is an issue in setting the boundaries of alternatives in Cook Inlet EIS's. Better knowledge of rip locations lessens the uncertainty in locating these boundaries. Also, the MMS has been criticized for not using local knowledge. This study obtains needed information and involves the local community in an area of their expertise.

Date Information Required: These data will be used for oil spill contingency planning if exploration is proposed from current leases, or otherwise not until the forthcoming Oil and Gas Leasing Program 2003 to 2008.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Evaluation of Sub-Sea Physical Environmental Data for the Beaufort Sea OCS and Incorporation into a Geographic Information System (GIS) Database

Estimated Costs (in thousands)

Period of Performance: FY 1999-2001

FY1999 – \$397

Total Cost: \$397

Description:

Background Biological habitats and potential archaeological sites in the Beaufort Sea are directly related to sea-floor morphology, substrate, and sediment cover; water depth; and the severity and cyclicity of dynamic physical processes. Recent exploration and development activities in the Beaufort Sea have highlighted the need for the careful interpretation, and in some cases, reinterpretation of shallow geological and high-resolution geophysical data in evaluating sea floor environmental conditions, biological habitats, potential archaeological sites, and critical pipeline routes for the distribution of oil and gas from OCS development activities. This study will be completed in the year 2001 and will be used in order to evaluate future exploration and development drilling and pipeline plans for the Beaufort Sea.

Objectives The objective of this study is to develop an integrated seafloor characterization and data set for the Beaufort Sea Outer Continental Shelf. All available high-resolution seismic data and shallow subsurface geologic data from various site-specific surveys data is to be identified and compiled. The data will be interpreted and quantified in appropriate formats to describe environmental features of the seafloor surface and shallow strata. Analytical tools and manuals will be developed for use by analysts.

Methods The contractor will interpret all available geophysical survey data, geologic data sets, and data from site-specific survey reports for the Beaufort Sea OCS and from Liberty and Northstar pipeline survey projects, and incorporate the data into a GIS database. Data sets will be created for ice gouging, strudel scour, and other surface and sub-bottom features, including a important marine habitat (i.e., the Boulder Patch) and high profile features of archeological importance. Routines will be established within ArcView/Spatial Analyst that would analyze the database and produce interpretive data and maps. A users manual will be written that explains the database structure, a data dictionary and describes the analysis tools to query and analyze the database for the specific purposes defined within the objectives. A reference manual that describes and illustrates interpreted data will be written.

Products A geospatial database of sub-sea physical and environmental data, GIS analysis tools, users manual, reference manual, training, journal articles, conferences, web-based reference manual

Importance to MMS This unified database will add significantly to the knowledge of ice-sea floor characteristics, interaction and dynamics, critical marine habitat, the identification of potential archeological sites, and serve as a standard for evaluating exploration, production, and transportation of oil and gas in the Beaufort Sea OCS. The database will add significant new information for future EIS's planned for the Beaufort Sea. The data from this study will update the information in the Section that describes the Description of the Environment. The information will be used in the following MMS environmental assessment and decision processes: (1) provide data for future analysis of the regional potential of prehistoric archaeological resources for implementing 30 CFR 250.126 and provisions of the National Historical Preservation Act; (2) provide critical habitat information for development projects and the evaluation of exploration plans; (3) provide ice gouge, strudel scour and other oceanographic information pertinent to oil development activities; (4) provide other such site-specific and regional data for environmental studies and for writing EIS's and environmental assessments; and (5) assist in evaluation of site and pipeline alternatives EIS's and environmental assessments.

Date Information Required: This information will facilitate preparation of the EIS for the Beaufort Sea Lease Sale 176 in 2002. The deliverables will provide valuable information for future NEPA assessments and exploration or development plan reviews.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: N/A

Title: Synthesis and Collection of Meteorological Data in the Nearshore Beaufort Sea

Estimated Cost (in thousands)

Period of Performance: FY 2000-2002

FY 2001 - \$170 to \$250

Total Cost: \$170 to \$250

Description:

Background Near future development in the Alaska OCS will be in the nearshore region of the Beaufort Sea. We know from Kozo's research in the 1970's and 1980's that the upper air pressure fields on which modeled wind fields used in Arctic regional circulation models are based give increasing inaccurate results for surface winds within 20-30 kilometers of the Beaufort Sea coast. In OCS areas off the contiguous 48 States and in the Bering Sea, MMS has established a network of meteorological buoys to monitor the lower atmosphere over long periods (10 years). Existing public domain datasets for the Beaufort nearshore are limited and with time series in terms of months, too short to provide sufficient time series for use in MMS models, such as COZOIL, the MMS oil weathering model, or the nearshore circulation model proposed within this strategic plan. Recent CMI studies comparing simulated winds from different Arctic and hemispheric wind models to Pt. Barrow winds are not relevant to this study. This is because along the Beaufort Sea coast towards the east, orographic and sea breeze effects are too great.

Objectives The objectives of this study are to collate and collect meteorological data in Beaufort Sea locations subject to immediate development. This study will develop a wind time series for sensitivity testing of MMS's nearshore and general regional circulation and trajectory models for the Beaufort Sea.

Methods The methods of this study are to:

1. Collate existing time-series meteorological data from OCS, Endicott Development Monitoring, other sources in the Beaufort Sea.
2. Coordinate collection of time series data with Alaska Department of Environmental Conservation efforts in its Air Quality and Industry Preparedness and Pipeline Programs.
3. Conduct cross-correlation statistical analysis of wind time-series data from Barrow, Deadhorse, Northstar, Liberty and other relevant data sets.

4. Collect a 2-year wind time series from Northstar, Endicott and Liberty locations.
5. Synthesize existing time-series along with meteorological metadata into TIMS compatible format.
6. Create a Technical Information Management System compatible database for 2-year wind time series.

Products The products of this study are:

1. Digital wind time series data.
2. Digital historical wind data for the nearshore Beaufort Sea.
3. Final reports with statistical and synthesis results.

Importance to MMS The MMS uses circulation models requiring meteorological information in EIS's, other environmental assessments, and oil-spill contingency planning. This information would be used in the MMS oil weathering model, the proposed nearshore circulation model, COZOIL, and would provide meteorological data to concurrent field studies such as "Arctic Nearshore Impact Monitoring in Development Area (ANIMIDA)." The database will be provided to BES/TAG to use in validating the MMS Arctic Regional Circulation Model and Oil Spill Trajectory Analysis.

Date Information Required: This study will start in FY 2000 to support enhancement of circulation models and review of future oil-spill contingency plans. It will also support the second and third year of ANIMIDA. The information will also be used for Beaufort Lease Sale 176 EIS.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-02

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Beaufort Sea Nearshore Under-Ice Currents: Science, Analysis, and Logistics

Actual Costs (in thousands)

Period of Performance: FY 1999-2001

FY 1999 - \$145

Total Cost: \$145

Description:

Background Understanding the underice currents is a necessary precursor to estimating potential effects on sensitive resources from oil spills or in the landfast ice zone, and in particular at the Liberty and Northstar projects. The one study of underice currents by MMS (in 1978) indicated that underice oil spills can move and pose risk to off-site, and in particular, shoreward resources. Such spill risk cannot be evaluated fully with the standard MMS oil risk analysis based on regional circulation. Another important question is whether the underice currents could transport suspended sediments from the project area to the nearby Boulder Patch, and endanger kelp during critical underice growth period.

The 1978 study found that average currents under landfast ice appeared to be related to brine drainage and peak currents to negative surges, with neither related to the regional circulation pattern. The study was unable to measure currents directly under the ice, but instead calculated them from mass-balance considerations to average of 6 centimeters per second (cm/s) and to peak up to 37 cm/s towards the coast. Depending on the shallowness of the unmeasured pycnocline, these currents may have been faster. Underice current speed and direction are important because currents of 10-20 cm/s will move spilled oil along the underside of the ice.

Objectives The objectives of this study are to:

1. Measure currents, temperature, and salinity hourly at three locations in the landfast ice zone in the vicinities of Northstar and Liberty prospects.
2. Quantify the magnitude of current variability and to describe the relationship between currents and local winds.
3. Determine the vertical structure of the currents throughout the water column and how the structure changes with the development of the landfast ice through the winter and in summer when the ice melts and rivers flood the inner shelf.

Methods The methods of this study are:

1. A 1200 kHz acoustic Doppler current profilers (ADCPs) will be moored at three sites near Liberty and Northstar prospects for one year. The mooring closest to Liberty will include a SeaCat with transmissometer.
2. Local winds measured at Deadhorse and sea level data collected at the Waterflood facility will be collated for time-series comparison with mooring data.
3. Standard physical oceanographic time-series analyses (e.g., univariate statistical descriptors and correlation in both time and frequency domains) and velocity shear calculations will be done.

Products Peer-reviewed journal article and final report.

Importance to MMS This study will be useful to MMS in evaluating possible cumulative effects from two decades of oil production and industry development along the Beaufort Sea coast. The data from the study will be comparable to the earlier MMS pre-development studies.

Date Information Required: This information will be used to evaluate oil spill contingency plans. It would also be used for NEPA assessments, such as the Oil and Gas Leasing Program 2003-2008 EIS, post-lease environmental assessment of Beaufort Lease Sale 176, and probable lease sales in the 2003-2008 Leasing Program.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-02

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Cooperative Agreement with CMI

Title: Beaufort Sea and Chukchi Sea Seasonal Variability for Two Arctic Climate States

Actual Costs (in thousands)

Period of Performance: FY 1999-2002

FY 1999 - \$282

Total Cost: \$282

Description:

Background Proshutinsky and Johnson (1997) recently showed evidence for the existence of two regimes or climate states for arctic atmosphere-ice-ocean circulation. Wind-driven motion in the Arctic was found to alternate between anticyclonic and cyclonic circulation with each regime persisting for 5-7 years, based on analysis of modeled sea level and ice motion. Anticyclonic wind-driven motion in the Arctic and Beaufort Sea appeared during 1946-1952, 1958-1962, 1972-1979, and 1984-1988. Cyclonic motion appeared during 1953-1957, 1963-1971, 1980-1983, and 1989-1997. The two climate states should differ in ice cover, ice thickness and drift, circulation (including reversal of the Beaufort gyre), ocean temperature and salinity, heat fluxes, wind speed, atmospheric pressure, cloudiness, and precipitation and runoff. Confirmation of significant climate state differences has strong implications for both circulation and oil spill modeling in the Arctic. MMS would need to take climate state differences into account to avoid unintentional bias and error in stochastic modeling of water, ice, or oil movement.

Objectives The objectives of this study are to:

1. Compare temporal and spatial variability of environmental fields at seasonal and interannual time scales.
2. Compare circulation and ice drift data for the two climate states.
3. Compare differences between ice cover for the two climate states.
4. Compare differences in 3D temperature and salinity distributions for the two climate states.

Methods The methods of this study are:

1. Temporal and spatial variability of environmental fields will be analyzed using standard oceanographic statistical analyses, time series analyses, and empirical orthogonal function analysis.
2. A hierarchy of modeling studies using a 3D circulation model will be used to compare ice drift and ocean circulation under the two regimes.
3. Historical SMMR and SSM/I data collected since the late 1970's and the Walsh Johnson data set (digitized ice charts for the period 1905-1995) will be assigned to the two climate states and compared to calculate the differences in ice concentration/cover for the two states.
4. The 3D model will be used to compare temperature and salinity distributions for the two climate states on the basis of model results and observational data collected during the two climate states.

Products Remotely-sensed ice motion fields; simulated surface circulation, wind forcing, ice motion, and ice cover fields for each climate state; peer-reviewed journal article; and final report.

Importance to MMS This study is precursor in evaluating whether MMS needs to change how we model Arctic circulation and oil spill trajectories. If this study confirms the importance of climate states in the Arctic, then using data averaged across both climate states to drive the circulation models may give erroneous results.

Date Information Required: This would be used for the Oil and Gas Leasing Program 2003-2008 EIS, post-lease environmental assessment of Beaufort Lease Sale 176, and probable lease sales in the 2003-2008 Leasing Program.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Revision of the OCS Oil-Weathering Model: Phases II and III

Actual Costs (in thousands)

FY1999 - \$399

Total Cost: \$399

Period of Performance: FY 1999-2001

Description:

Background This study will follow the recommendations made in the recently completed study "Revision of the OCS Oil-Weathering Model: Evaluation." The OCS Oil-Weathering Model (OWM) has been used as a major analytical tool in every Alaska OCS EIS since the model was developed in 1983. The algorithms used in the model date from the late 1970's and early 1980's. The primary findings from the Sintef study were that the existing MMS model was difficult to use because of antiquated code, that it was likely to produce erroneous results for many crudes, and that its algorithms needed to be updated or replaced with ones that incorporated the past two decade and a half of oil spill research. The primary recommendation was that rather than updating algorithms and code in the MMS model, MMS would find it more cost-effective for MMS to buy into an existing state-of-the-art OWM.

Objectives The objectives of this study are to obtain an existing state-of-the-art OWM for MMS use and to upgrade the model to meet MMS needs.

Methods The methods of the study are:

1. Obtain existing state-of-art OWM.
2. Train MMS users.
3. Modify/improve the new OWM to meet MMS needs in environmental assessment and contingency plan review.
4. Add oils of concern to MMS to the OWM oil library.
5. Promote development of an experimental oil spill database that allows validation of model algorithms in various models against real data.

Products Windows 95/NT, PC-based OWM code, any necessary software to run the model, users' manual, 1-day workshop to demonstrate model and provide user training, peer-reviewed journal article, and final report.

Importance to MMS Oil-spill fate and behavior cannot be derived fully from the MMS OSRA and depend on use of the Oil-Spill Weathering Model. The model provides EIS analysts with a common, quantitative set of spill scenarios. The rate of oil dispersion into the water column calculated by the model is used to estimate whether State and Federal water-quality standards and criteria would be exceeded by a spill, over what area, and for how long. The weathering model calculates the area covered by a spill, an important parameter for estimating effects; but the OSRA does not. The model calculates the persistence of the lighter, but most toxic, components of the oil slick. This calculation allows analysts to directly estimate persistence of toxicity, rather than assume, as in the OSRA, that these toxic components persist over the first 3 days of a spill. Because the size of a spill affects its weathering, the model helps distinguish between effects of larger and smaller ">1,000-bbl" spills, e.g., between the effects of an average tanker spill versus an average pipeline spill. The in situ viscosity and degree of emulsification provided by the model are used in assessing the mitigation by and effectiveness of oil-spill countermeasures such as mechanical recovery, dispersant, and in situ burning. The model is similarly used by industry and MMS for oil-spill-contingency planning and has been run for the Regional Response Team in real-time response to spills such as the *Exxon Valdez* spill.

Date Information Required: Information from this study will be used by the MMS, Alaska OCS Region, staff in preparing all future EIS's and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Competitive

Title: Update of Circulation and Oil-Spill-Trajectory Model for Beaufort Sea Nearshore Development Areas

Estimated Cost (in thousands) **Period of Performance:** FY 2000-2001

FY 2001 - \$280 to \$420

Total Cost \$280 to \$420

Description:

Background Since 1991, the MMS has been funding work on the adaptation of the SPEM model to the Alaskan Arctic coastal region. The SPEM originally stood for Semi-Spectral Primitive Equation Model, but the current 5.1 version of SPEM retains the acronym while no longer using a spectral component. The SPEM has the advantage of being a public-domain model with an international scientific users' group that has been making improvements in the model beyond those contracted for by MMS. The MMS is currently funding Rutgers University to implement a curvilinear grid to enhance SPEM resolution and to execute a 10-year simulation using historical data. SPEM should provide needed information for MMS's assessments for regional oil and gas lease sales. However, SPEM is unable to resolve the small barrier islands and ocean circulation within the first 10-20 kilometers beyond the State 3-mile line, where Federal OCS development is accelerating.

This study will build on the recommendations and results from multi year simulations of Arctic circulation using the SPEM 5.1 model in an FY 1996-1999 study, recently completed CMI Arctic 2-D and 1.5-D modeling experiments, and additional Chukchi and Beaufort Sea circulation data derived from ongoing CMI and international Arctic oceanographic studies. The MMS and other current ice models are based on ice physics, which cannot be reliably scaled down to the approximately 1-km grid scale necessary to resolve OCS leasing issues or to the finer scales needed postlease to evaluate specific development issues. However, improved ice algorithms are currently being developed in Navy-sponsored research for the necessary scale. The wind fields available for the current modeling effort do not have accurate corrections for nearshore sea-breeze or orographic effects. Winds near Barrow are correctly depicted in the data, but winds farther south along the Chukchi Sea coast or eastward along the Beaufort Sea coast are known to be wrong in magnitude and direction, out to 20 or more kilometers. This is about as far offshore as current oil industry interest extends in the Beaufort Sea.

Objectives The objective of this study is to obtain a finer resolution model to simulate circulation in the nearshore Beaufort Sea, with emphasis on the first 25 kilometers beyond land between the Colville River

and Canning Rivers. The model will be designed to provide the information needed to run the MMS oil spill trajectory model and will also provide surface circulation fields that can be used to drive the MMS COZOIL model.

Methods The SPEM or an equivalent 3-dimensional, variable-scale (wind, ice, ocean) model may be used to feed information to this finer grid model. Consideration will be given to nesting smaller domain grids or models suitable for evaluating nearshore circulation and oil spill movement. The possibility of blending observational data into the model—particularly recent circulation, winds, and finer-scale ice data will be evaluated.

Products Simulated wind, current, and ice velocity fields on tape; circulation model; users' manual, report, and peer-reviewed journal paper.

Importance to MMS The Circulation and Oil-Spill-Trajectory Model is a cornerstone to regional EIS's, environmental assessments, and oil-spill-contingency planning. Oil-spill issues involving or resolvable by the trajectory model constitute half the public comments submitted on EIS's on proposed offshore oil and gas sales in the Alaska OCS Region. The MMS is currently using an Arctic basin model with 20-km grid spacing to project oil spill trajectories within 10-km of land for ongoing developmental Environmental Impact Statements. The model does not include the barrier islands even though the developments lie within the barrier islands. Model results are used to evaluate the risks and advantages of specific alternatives, and they are used to fine-tune protective lease-sale stipulations. The oil industry and MMS use the model results in preparation and review of postlease oil-spill-contingency plans. The Department of State used the model results to evaluate foreign policy implications of OCS activities. The U.S. Coast Guard uses model results in analysis of local, national, and international oil-transportation and spill-response issues. The Canadian and Alaskan oil industry and spill cooperatives have adapted portions of MMS circulation and trajectory models for their own application, including the placement of spill-response equipment. From the viewpoint of public and other governmental perceptions, it is critical to continue efforts to improve the art and reliability of circulation and trajectory models used in nearshore portion of the central Beaufort Sea.

Date Information Required: Information from this study will be used in preparing Arctic exploration and development EIS's and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive

Title: Environmental Sensitivity Index Shoreline Classification in the Beaufort Sea

Estimated Costs (in thousands)

FY 2000 - \$200 to \$300

Total Costs: \$200 to \$300

Period of Performance: FY 2000-2001

Description:

Background Industry and State and Federal Agencies including MMS form the Alaska North Slope Task Force. Of this group Industry, NOAA and the USCG are funding the compilation of Industry's Environmental Sensitivity Index (ESI) shoreline classification and biological data from the Colville to the Canning River.

The ESI shoreline classification contains water and land features, rivers and streams, source codes and Environmental Sensitivity Index classification for shoreline. This data is needed for use in the MMS Corporate Environmental Database and for computer analysis using ArcView. The Gulf Wide Information System (G-WIS) is designed to provide an authoritative database for environmental analysis in MMS. With the use of peripheral programs, analysts will be able to quickly identify resources at risk and run analytical routines to determine potential impacts. Currently the oil industry has mapped ESI type from the Colville to the Canning River. The ESI shoreline classification data is not in the G-WIS format. Data on ESI shoreline type for the Beaufort Sea from Barrow to the Colville River and from the Canning River to the Canadian Border is more than 20 years old and is very generalized. It is not compatible with the accuracy of the CORIS data structure and is not in a digital format.

Objectives The primary objective of this study is to obtain an updated ESI shoreline data set for use in ArcView/Arc Info. The ESI shoreline data set will also be used in analysis of oil spill prevention plans and to facilitate faster and more accurate environmental analysis in the Beaufort Sea environmental impact statements and environmental assessments.

Methods The methods of this study are:

1. Use existing Industry ESI shoreline data from the Colville to Flaxman Island and convert it into a data structure that builds on the CORIS data structure.

2. Identify any additional data completed by Industry by the start of this study and convert it into a data structure that builds on the CORIS data structure model.
3. Map the Beaufort Sea coastline ESI shoreline type from Barrow to the Colville and the Canning to the Canadian Border using aerial overflights and videotography.
4. Select the appropriate number of sites for ground-truthing remotely collected ESI shoreline type data.
5. Establish ESI shoreline type data set using video and ground truth data. This data set is for Beaufort Sea shoreline from Barrow to the Colville and the Canning to the Canadian consistent with G-WIS data structure and the resolution of the ESI data from the Colville to the Canning.
6. Create a data set containing:
 - a. Water and land polygons
 - b. Type of linear feature
 - c. Source Code
 - d. ESI Classification

Products Data set containing:

- | | |
|--------------------------------------|---------------------------|
| 1. Water and land arcs, and polygons | 2. Type of linear feature |
| 3. Source Code | 4. ESI Classification |
| 5. Original data | 6. Data Report |

Importance to MMS The majority of Beaufort Sea coastline was classified for sensitivity to oil spills 20 years ago. This ESI shoreline data is out of date and needs to be remapped in order for the data to be useable. Over the past 10 years, MMS has sponsored modeling research that makes use of this information. The ESI shoreline classification is gaining increasing use within MMS for environmental assessment, for Coastal and Surf Zone Oil-Spill-Transport Model (COZOIL) use and G-WIS. This study would improve MMS's ability to assess potential shoreline effects by providing direct information to analysts, improving the selection of environmental resource areas for the oil spill risk analysis model and improving the information base in the COZOIL model. This study would update the existing classification of shoreline in the Beaufort Sea and make the data available in a digital format. This information would be available in Technical Information Management System mapping for MMS decision makers, Environmental Impact Statement analysts and others who need the information for regulatory function.

Date Information Required: This study should be done in FY 2000 to support review of oil-spill contingency plans for developments in the Beaufort Sea and for Beaufort Lease Sale 176 EIS.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Cooperative Agreement with CMI

Title: Kinetics and Mechanisms of Slow PAH Desorption from Lower Cook Inlet and Beaufort Sea Sediments

Actual Costs (in thousands):

Period of Performance: FY 2000-2002

FY 1999 - \$59

Total Cost: \$59

Description:

Background Adsorption to sediment particles is a key process in determining the transport and fate of polycyclic aromatic hydrocarbons (PAH) in the marine environment. Previous CMI-funded studies of lower Cook Inlet sediments have shown that a substantial part of PAH adsorption is not rapidly reversible. Further study is needed to develop the ability to predict how adsorption and desorption would affect the longer term persistence (and toxicity) of PAH contamination in Alaska marine sediments. Recent *Exxon Valdez* studies have shown that the residual PAH concentrations in contaminated sediments are more toxic at much lower concentrations than previously estimated.

Objectives The objectives of this study are to test the hypotheses:

1. PAH adsorption found apparently irreversible in earlier CMI experiments is reversible with longer reaction times or greater water:particle ratios.
2. Interactions of PAH with sediment organic matter are responsible for adsorption that appears to be irreversible.
3. The properties of sediment organic matter govern adsorption and desorption of PAH by marine sediments.

Methods Phenanthrene will be used as a test PAH. Adsorption and desorption of phenanthrene will be measured using radiolabeled phenanthrene at multiple phenanthrene concentrations over adsorption times up to 60 days. Desorption experiments will be followed for up to 180 days or until desorption reaches steady state. Sediments used will include characterized subsamples from CMI studies in nearshore Beaufort Sea and lower Cook Inlet. Coal samples from Cook Inlet are also being used as a substrate.

Products Peer-reviewed journal article and final report.

Importance to MMS The study will lead to better predictive capability for the environmental fate of PAH, based on effects of sediment organic matter sources and composition on desorption. Understanding differences in sorption between Cook Inlet sediments and Beaufort Sea sediments will help MMS analysts make use of information from both planning areas in environmental assessments.

Date Information Required: The information will be used in preparation of the Beaufort Sea Sale 176 EIS in 2001 and any environmental assessments for existing Beaufort Sea and Cook Inlet leases.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-02

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Hydrocarbon Analysis Interlaboratory Calibration Exercise

Actual Costs (in thousands)

FY 1999 - \$15

Total Cost: \$15

Period of Performance: FY 1999-2000

Description:

Background To insure quality results, MMS requests that MMS contractors participate in the NOAA/NIST Organics Interlaboratory Calibration Exercise. UCLA is subcontractor on the MMS study: "Historical Changes in Trace Metals and Hydrocarbons in the Inner Shelf Sediments, Beaufort Sea: Prior and Subsequent to Petroleum-Related Industrial Developments." This contract provides for UCLA's participation in the intercalibration exercise.

Objective The objective of this study is to verify the performing laboratory's skill in analyzing petroleum hydrocarbons in marine sediments.

Methods The method of this study is to participate in the NOAA/NIST Organics Interlaboratory Calibration Exercise, for sediment petroleum hydrocarbons analytes.

Products Final report.

Importance to MMS MMS needs and requires high quality petroleum hydrocarbon analyses in OCS sediment monitoring studies. This study will verify the capability of the performing laboratory to provide quality analyses.

Date Information Required: The information would be used to support the study: "Historical Changes in Trace Metals and Hydrocarbons in the Inner Shelf Sediments, Beaufort Sea: Prior and Subsequent to Petroleum-Related Industrial Developments," completed fall 1999. That study provides environmental assessment information for Beaufort Lease Sale 176, the Liberty EIS, and would also be used for the 2003-2008 Five Year Program EIS, and probable lease sales in the 2003-2008 Five Year Program.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-02

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Petroleum Hydrocarbon Degrading Communities in Beaufort Sea Sediments

Actual Costs (in thousands)

FY 1999 - \$50

FY 2000- \$67

FY 2001- \$67

Total Cost: \$185

Period of Performance: FY 1999-2002

Description:

Background High latitude marine oil spills have demonstrated that the composition of microbial communities affects rates of hydrocarbon degradation. Prior MMS research in the Beaufort Sea in the late 1970's and early 1980's indicated that indigenous microbes in this environment were poorly suited for rapid hydrocarbon destruction. Little research has been performed on Beaufort hydrocarbon degraders since then, and little is known about whether sediment microbes have acclimated to hydrocarbon inputs in the last 20 years.

Objectives The objectives of this study are to:

1. Evaluate the current degree of microbial community acclimation to hydrocarbons from Barrow to the Prudhoe Bay/Northstar/Liberty area.
2. Evaluate the effects of fine-grained Beaufort Sea sediments on rates of community acclimation.
3. Evaluate how Beaufort Sea sediments might affect bioavailability of petroleum to communities of acclimated microbes.

Methods Surface sediments will be collected and the following measured:

1. Sediment microbial enumeration assays for populations of specific metabolic types.
2. Sediment macronutrient levels.
3. Most-probable number assays (MPN's) for crude oil emulsifiers and marine heterotrophs.

4. MPN's for specific substrates (e.g., PAH and alkane metabolizing populations).
5. Direct counts of sediment microbes.
6. Microbial activity will determined from enumeration assays and radiocarbon-labeled hydrocarbon assays.
7. Gas chromatography analyses for petroleum hydrocarbon in samples with higher microbial numbers/activity.

Products Peer-reviewed journal article and final report

Importance to MMS This study will be useful to MMS in possible cumulative effects monitoring of upcoming offshore development along the Beaufort Sea coast. The data from the study will be comparable to the earlier MMS pre-development studies.

Date Information Required: This information will be used for the Oil and Gas Leasing Program 2003-2008 EIS, post-lease environmental assessment of Beaufort Lease Sale 176, and probable lease sales in the Oil and Gas Leasing Program 2003-2008.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-02

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, Cook Inlet

Type: Cooperative Agreement with CMI

Title: The Role of Zooplankton in the Distribution of Hydrocarbons

Actual Costs (in thousands)	Period of Performance: FY 1999-2001
FY1999 - \$ 6	
FY2000 - \$ 7.5	
FY2001 - \$ 7.5	
Total Cost: \$21	

Description:

Background Copepods play an important role in carbon flux in marine ecosystems. Vertical transport of carbon from the euphotic surface water to the benthos occurs when copepods feed on diatoms and incorporate them into larger, negatively buoyant fecal pellets. Therefore, analysis of hydrocarbon content of fecal pellets would provide insights in understanding the role of copepods in distribution and remediation of hydrocarbons. Data derived from analysis of copepod fecal pellets will provide baseline information for experimentation and modeling of ecosystem processes, which include accumulation of hydrocarbons in higher trophic levels such as commercial fish species.

Objectives The objectives of this study are to determine the role of copepods in the distribution and bioremediation of hydrocarbons in the environment. Specifically, this study will:

1. Determine the composition and seasonal variation of lipids in forage plankton in Prince William Sound.
2. Determine the relationships between lipid content and lipid composition in forage plankton and patterns of accumulation of hydrocarbons in copepod body tissue.
3. Determine the role of the copepods *Neocalanus* spp. and *Pseudocalanus* spp. in the distribution of mineral hydrocarbons in the environment.

Methods A series of experiments will be conducted at Auke Bay Lab (ABL), in Southeast Alaska.

1. Copepods will be collected from Prince William Sound and Lynn Canal, near Auke Bay.

2. Zooplankton will be collected weekly from Lynn Canal, during April – August, 2000, using vertical tows of a bongo net.
3. The subject species will be placed in incubators and exposed to sublethal concentrations of hydrocarbons (~10 ppm) for 96 hrs. At the end of the experiment, copepods and their fecal pellets will be collected and taken to ABL for analysis of lipids and hydrocarbons using standard operating procedures developed by the Lab.
4. To evaluate the influence of oil exposure on egg production, experimentally dosed female copepods will be sorted alive into individual containers and egg production experiments will be conducted every 2 weeks.
5. Concomitant with live sampling for experimental animals, a sample will be collected for lipid analysis and immediately frozen for later analysis at ABL. For evaluation of differences in hydrocarbon uptake due to amount of surface area, measurements of length, wet weight, and dry weight of zooplankton will be collected from a random sample as often as experiments are conducted.

Importance to MMS This experimental study provides valuable information about processes at the level of primary consumers that affect the transference of hydrocarbons through the food chain and water column. It specifically supports the environmental assessment process for potential lease sales in Cook Inlet and the Gulf of Alaska and, in general, supports assessments for potential developments in northern latitudes.

Date Information Required: This information supports pre- and post-lease information needs for Cook Inlet and Gulf of Alaska lease sales.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Cook Inlet

Type: USGS Biological Resources Division

Title: Monitoring and Evaluating Effects on Seabird Colonies in Potential Oil and Gas Development Areas

Actual Costs (in thousands)

FY1997 - \$141 (BRD)

FY1998 - \$145 (BRD)

FY1999 - \$145 (BRD)

FY2000 - \$145 (BRD)

Total Cost: \$576(BRD)

Period of Performance: FY 1997-2000

Description:

Background Seabird colonies have been monitored in Alaska since the beginning of the OCS program because seabirds are major components of Alaskan marine ecosystems, may be especially vulnerable to OCS activity and are protected by various U.S. and international laws and treaties. Further, various user groups, including the environmental community and Alaskan Natives, who use many seabird species for subsistence, are concerned about possible effects on populations from OCS-related activities. The record of bird monitoring at Alaskan seabird colonies is variable with the most useful information coming from long-term studies which have generated databases permitting analysis of regional population status and trends. The best studies have yielded a substantial body of standardized monitoring information to build upon, thus permitting intercolony comparisons, interyear trend analyses, and detection of potential effects of oil-and-gas development. BRD scientists, in collaboration with biologists from the Alaska Maritime NWR, have conducted a long-term study of seabirds, and their ecological relationships, at Chisik, Duck and Barren Islands in Cook Inlet. During FY2000 they will be conducting a review and synthesis of all data collected. One goal of their analysis will be the development of guidelines and methods for minimum-level monitoring of seabird biology and populations with the expectation of application of their findings to continuing studies in Cook Inlet.

Objectives The overall goal of monitoring at selected seabird colonies in potential oil- and gas-development areas was to extend the records of regional population trends necessary for characterizing natural fluctuations in attendance and distinguishing between these and large or abrupt colony changes that might occur coincidentally with an oil spill or local human disturbances. Also, analysis of such information was to provide some indication of causal factors. Using monitoring guidelines and methods to be developed during FY2000, the specific objectives are to determine:

1. Annual attendance of breeding and nonbreeding individuals at selected colonies.

2. Annual breeding success and productivity at these several of these colonies.
3. Colony-specific information on other demographic or ecological characteristics that may reflect variation in the health and status of the colonies that are monitored.
4. The location of pelagic-seabird-concentration areas and, if possible, relate this to the occurrence of prey populations and environmental parameters.

Methods Colonies at Chisik and Gull Islands were monitored using standardized methodologies developed with MMS funding by FWS and BRD, including counts of bird numbers on preselected plots, measures of reproductive success, and behavioral observation.

Products By September 30, 2000, a detailed report will be submitted summarizing the BRD/USFWS review and synthesis of all data collected during the 5-year research period, 1995-1999. Tabulated data will be deposited in the Alaskan Catalog of Seabird Colonies and/or Pacific Seabird Monitoring Database, as appropriate.

Importance to MMS The development of a long-term database of population status and trends has been essential for analysis of environmental impacts on regional seabird populations in potential oil- and gas-development areas. Such monitoring information also has been used to characterize natural fluctuations in numbers of birds present, and will facilitate reasonable distinction between such fluctuations and large or abrupt colony changes that might occur coincidentally with an oil spill or local human disturbances. Also, such information is expected to clarify causal factors and has been useful in the development of mitigating measures. In addition, accurate information on seabird populations has facilitated strategic planning of seabird studies in the MMS Environmental Studies Program. At present the record of population fluctuations at most Alaskan seabird colonies is intermittent and relatively short-term, with few extending a decade or more. The study results will be applicable to potential exploration-plan reviews, postsale mitigation, and outreach activities.

Date Information Required: Completion of this study is needed to support environmental assessment and exploration monitoring for past, ongoing, and potential offshore operations in Alaska OCS planning areas. This study will help focus the intent of the mitigation measures concerning protection of birds that have been used in every Alaska OCS Region EIS. The study will also develop information that addresses public concerns raised during outreach efforts.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Shelikof Strait and Kodiak

Type: Cooperative Agreement with CMI

Title: Feeding Ecology of Maturing Sockeye Salmon (*Oncorhynchus nerka*) in Nearshore Waters of the Kodiak Archipelago

Actual Costs (in thousands)

FY1998 - \$31

FY1999 - \$26

FY2000 - -0-

Total Cost: \$57

Period of Performance: FY 1998-2000

Description:

Background Knowledge of the sockeye salmon's marine life history has numerous data gaps, except for ocean distribution areas and offshore food web dynamics. Sockeye salmon nearshore feeding ecology is limited to several research efforts from Oregon to the Sea of Okhotsk. Most of these studies are site specific and their findings can't be used for other locations. Sampling in 1994 found that predominant prey for sampled fish in Kodiak (Shelikof Strait) waters were sand lances, snails, and euphausiids. These differ from the prey items found in other study areas (euphausiids, fish larvae, decapods, and amphipods). The feeding prevalence of mature fish, the stage of feeding cessation, and the major prey taxa utilized are research areas that still need to be addressed.

Objectives The objectives of this study are to:

1. Determine the incidence of feeding sockeye salmon from three known migration corridors (eastside Kodiak, westside Kodiak, and Alaska Peninsula areas) on a weekly basis from June through August.
2. Estimate feeding prevalence of sockeye salmon from two areas each less than 5 km from their natal stream terminus (Ayakulik and Moser-Olga Bay sections) weekly from June through August.
3. Identify and quantify the major prey taxa for sockeye salmon within the Shelikof Strait migration corridor and determine if location has an effect on prey types utilized.
4. Identify potential mechanisms of indirect effects on sockeye salmon, through prey utilization, due to development in oil and gas lease areas.

Methods This study will be conducted with the existing Alaska Department of Fish and Game (ADF&G) catch-age sampling program. Catch-age sampling is conducted in shore-based processing facilities on a weekly basis throughout the commercial fishing season. The study will identify the harvest area, gear type, and date for the sampled catch. Each sample will have a minimum of 100 sockeye salmon stomachs. ADF&G personnel will obtain complete digestive tracts immediately after they're removed from the fish at processing facilities.

Sampling will consist of:

1. Presence or absence of food items.
2. Stomach fullness (in 10% increments) determined visually with volumetric sampling performed on 15 stomachs per area/time strata.
3. Identification of prey taxa (to lowest taxonomic level possible).

Products Final report and peer-reviewed journal articles.

Importance to MMS The Shelikof Strait planning area is important for maturing Kodiak origin sockeye salmon. Prevailing currents in lower Cook Inlet and Shelikof Strait potentially extend impacts from oil and gas development and production throughout the inshore areas of the Kodiak Archipelago and the northeastern Alaska Peninsula. The results of the study will establish pre-impact baseline information that could be applied to development planning and oil spill mitigation efforts for future Cook Inlet lease sales. When key sockeye salmon forage species are identified, it will be possible to interpret what is known and published about their biology with respect to potential effects from oil and gas activities.

Date Information Required: This information is needed for future Cook Inlet lease sales.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Cook Inlet and Gulf of Alaska

Type: Cooperative Agreement with CMI

Title: Seabird Samples as Resources for Marine Environmental Assessment

Actual Costs (in thousands)

FY 2000: \$22.5

FY 2001: \$23.5

FY 2002: \$25.0

Total Cost: \$71.0

Period of Performance: FY 2000-2002

Description:

Background The birds of Alaska that are dependent upon marine environments comprise a complex array of more than 100 species occupying three trophic levels. These birds are a major component of Alaska's marine ecosystems and are vulnerable to both natural and anthropogenic changes (e.g., Outer Continental Shelf activities). Many species provide an important source of food for humans, and more generally, are heavily used for a variety of subsistence purposes by Alaskan natives. If analyses contrasting places or events are to be used to monitor the environment and biological systems, archival samples must be routinely preserved. Birds are excellent environmental indicators, and can be thought of as small biological filters sampling various aspects of marine ecosystems, and thus represent a useful model for such analyses. Further, many avian species are protected by various U. S. Laws and international treaties.

Objectives The objectives of this study are to:

1. Preserve and make available to the research community a substantially increased number of high-quality samples from marine and coastal birds in Alaska.
2. Make samples available to the research community for studies ranging from contaminants and stable isotopes to genetics and morphology.

Methods Samples from the Beaufort Sea and Cook Inlet will be given the highest priority. Collections will be made in connection with existing projects. Tissues and specimen data will be collected by a variety of participating scientists. Maximum use will be made of each individual bird, including when the quality of the specimen warrants it, the skin, almost-complete skeleton, two tissue samples, and stomach contents. No chemical will be used in the preparation process, except when a specimen is particularly fatty. In such cases the fat remaining after fleshing the skin is often removed with a solvent

(e.g., mineral spirits). Skin and skeleton preparations will be archival in quality, and are expected to last at least 300-400 years, given current information. Tissue samples will be archived in two, 2mL plastic cryovials and stored at -80 degrees C in the Alaska Frozen Tissue Collection (AFTC). Information on samples that are available to researchers for scientific study will be detailed in a web-site data base.

Products Quarterly progress reports, annual reports and a final report. A web-site data base will be updated annually with new specimen holdings making specimen availability apparent to the scientific community.

Importance to MMS This study supports a new source of bird tissues for use by scientists and other parties conducting studies of industrial contamination. This will permit enhanced postlease monitoring in the Beaufort Sea and Cook Inlet.

Date Information Required: This project is needed to support environmental assessment and exploration monitoring for past, ongoing, and upcoming offshore operations in Alaska planning areas. Data products and annual reports will provide critical and timely inputs to the environmental assessment process. The study also will develop information useful to enhancement of outreach efforts with local constituencies.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN 2001-2002

Region: Alaska

Planning Area: Beaufort Sea

Type: USGS, Biological Resources Division

Title: Monitoring Beaufort Sea Waterfowl and Marine Birds

Costs (in thousands)	Period of Performance: FY 1999-2003	
	MMS	BRD
FY1999 -	\$115	\$100
FY2000-	\$ 49	\$300
FY2001-	-0-	\$300
FY2002	-0-	\$300
Total Cost:	\$164	\$1,000

Description:

Background Oldsquaw, eiders, and other waterbirds feed, molt, stage and/or migrate in various Beaufort Sea marine habitats. Recent data show that threatened spectacled eiders, as well as other species of concern, stage in nearshore and offshore Beaufort Sea waters. An existing protocol, entitled "Design and Testing of a Monitoring Program for Beaufort Sea Waterfowl and Marine Birds" (OCS Study MMS 92-0060), was developed and tested in the Beaufort Sea area that includes the Northstar, Sandpiper, and Liberty Units. This study covers the areas and species most likely to be affected by activities associated with oil and gas development in these units.

Objectives The overall goal of this study is to monitor the effects of potentially disturbing activities associated with oil and gas development on the distribution and abundance of waterfowl and other waterbirds using marine habitats in the east-central Beaufort Sea. Specific objectives are to:

1. Use an existing protocol (Johnson and Gazey, 1992) to monitor numbers of Oldsquaw and other species in *industrial* and *control* areas defined by these investigators.
 - a. Perform replicate aerial surveys along previously established transects in a manner that will allow comparison with the earlier results.
 - b. Expand the survey to include nearshore areas between the original *industrial* (Jones-Return Islands) and *control* (Stockton-Maguire-Flaxman Islands) areas.
 - c. Define the range of variation for area waterfowl and marine bird populations, and correlate with environmental factors and oil and gas development activities.
2. Expand aerial monitoring about 50 km offshore to determine the extent of use of this habitat by eiders, in particular, where they would be vulnerable to oil spills originating in the Northstar and Liberty Units; determine if the use of specific areas is predictable.

3. Develop a monitoring protocol to determine distribution and abundance of Common Eiders breeding on barrier islands.
4. Investigate potential effects of disturbance on Oldsquaw and Common Eider annual cycle parameters that could cause changes in their distribution and abundance.
5. Compare the results with historical data to detect trends; coordinate with ongoing studies and incorporate pertinent interpretation of their findings into the final report.
6. Recommend cost-effective and feasible options for future monitoring.

Methods Waterfowl and marine bird populations will be monitored in the vicinity of ongoing and proposed oil industry activities in the east-central Beaufort Sea through three open-water seasons using an existing protocol that involves replicate aerial surveys of established transects and other areas indicated above. Using standard protocols, Common Eider distribution and abundance and factors potentially causing changes in these parameters for this species and the Oldsquaw will be investigated. The range of natural variation in population parameters will be further defined during these surveys and investigations, and the results correlated with historical data collected during earlier surveys and ongoing studies. Pertinent ambient environmental variables and industrial activity will be recorded and correlated with bird data.

Products Annual interim reports describing results of surveys and other studies, a stand-alone final report including analysis of all data, and peer-reviewed journal article(s). Data on area bird distributions will be supplied in a format importable into ArcView and TIMS Oracle databases.

Importance to MMS Offshore production of oil in the Beaufort Sea is planned for the Northstar, Liberty and possibly other units. Post-lease activities are expected to result in additional acoustic and visual disturbance of birds in marine areas due to increased vessel and helicopter traffic. Oil spills could reduce waterfowl populations that feed, molt, and/or stage in this area of the Beaufort Sea. Recent information suggests that threatened Spectacled Eiders stage prior to migration in this region of the Beaufort Sea. Information from this study also will provide the basis for mitigation measures.

Date Information Required: Study information will be used for environmental assessment related to the Liberty EIS, Beaufort Sea Sale 176 EIS and Northstar and Liberty monitoring.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: In-House Study/Interagency Agreement

Title: Monitoring the Distribution of Arctic Whales

Actual Costs (in thousands)

Period of Performance: FY 1996-2002

FY1996 - \$ 450
FY1997 - \$ 495
FY1998 - \$ 450
FY1999 - \$ 450
FY2000 - \$ 400
FY2001 - \$ 400
FY2002 - \$ 400
Total Cost: \$3,045

Description:

Background The MMS has conducted aerial surveys of the fall migration of bowhead whales each year since 1987. Methods are comparable from year to year, based on similar monitoring dating to 1979. Real-time data are used to implement overall seasonal restrictions and limitations on geological and geophysical exploration. The study provides the only long-term database for evaluating potential cumulative effects of oil- and gas-exploration activities on the entire bowhead-migration corridor across the Alaskan Beaufort Sea. Project reports compare distances from shore and the water depths used by migrating bowheads. Data are collected in a robust GIS-compatible data structure.

Objectives The primary goals of the project are to:

1. Provide real-time data to MMS and the National Marine Fisheries Service (NMFS) on the general progress of the fall migration of bowhead whales across the Alaskan Beaufort Sea.
2. Monitor temporal and spatial trends in the distribution, relative abundance, habitat, and behaviors (e.g., feeding) of endangered whales in arctic waters.
3. Define and analyze for significant interyear differences and long-term trends in the distance from shore and the water depth at which whales migrate.
4. Provide an objective area-wide context for management interpretation of the overall fall migration of bowhead whales and site-specific study results.

Methods Aerial surveys, based out of Deadhorse, Alaska, during September and October, monitor the fall bowhead migration between 140°W. and 157°W. longitudes, south of 72°N. latitude. Particular emphasis is placed on regional randomized transects to assess fine-scale shifts in the migration axis of bowhead whales across the Beaufort Sea, and on the coordination of effort and management of data necessary to support seasonal offshore-drilling regulations. The project analyzes migration timing, distribution, relative abundance, habitat associations, swim directions, water depths, and behaviors of whales, as well as ice type and percentage at bowhead sightings. Belugas, gray whales, and polar bears are regularly recorded along incidental sightings of other marine mammals.

Products Daily reports of bowhead whale distribution during fall migrations, final reports that summarize each fall migration, and journal articles. Data are also shared with site-specific studies to define bowhead responses to individual oil-industry activities. Incidental oceanographic observations are shared with the National Ice Center and National Weather Service to ground-truth satellite imagery.

Importance to MMS This continuing in-house study is needed for decisions on environmental assessment and exploration monitoring for past and upcoming offshore operations in the Beaufort Sea (from Lease Sales BF, 71, 124, 144, 170, and 176). It does this by providing long-term information on the potential for area-wide and cumulative effects of oil and gas activity on the fall migration of bowhead whales. The MMS Regional Supervisor, Field Operations, needs this information to ensure that industry activities do not pose a “threat of serious, irreparable, or immediate harm to the species”. The BWASP also provides real-time data to MMS and NMFS on each fall migration of bowhead whales across the Alaskan Beaufort Sea for implementing overall limitations on seasonal drilling and geological and/or geophysical exploration. The bowhead whale is protected under the Endangered Species Act and is of great importance to Alaskan Natives for cultural and subsistence purposes. Project information is used to ensure that planned activities will not have an unmitigable adverse effect on the availability of the bowhead whale to meet subsistence needs by causing whales to abandon or avoid hunting areas. Important concerns about the effects of seismic and drilling noise on bowhead whales have been frequently expressed by subsistence hunters in correspondence, public hearings, a 1997 seismic workshop, and a 1999 OCS Policy Committee Meeting.

Date Information Required: Information is needed each year to monitor the migration of bowhead whales past active seismic and drilling operations. Information from this study also will be needed in support the proposed Beaufort Sea Sale 176 EIS and development monitoring.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: USGS Biological Resources Division

Title: Alaskan Marine Mammal Tissues Archival Project

Actual Costs (in thousands)

Period of Performance: FY 1996-2002

FY1996 - \$ 80 (BRD)

FY1997 - \$ 88 (BRD)

FY1998 - \$ 88 (BRD)

FY1999 - \$ 88 (BRD)

FY2000 - \$ 88 (BRD)

FY2001 - \$ 88 (BRD)

FY2002 - \$ 88 (BRD)

Total Cost: \$608 (BRD)

Description:

Background Alaskan Natives use many marine mammal species for subsistence and thus are concerned about possible contamination from OCS-related discharges. Also, chemical pollution can have adverse effects on marine mammals. The collection of marine mammal tissues over a period of years allows for determination of baseline contaminant loads for comparisons with levels in specimens associated with oil spills or in the vicinity of drilling operations. Since adding a part-time USGS-BRD Biological Technician to the Project, the number of samples collected has increased. The project also has linkages with NOAA, a lead agency for AEPS/AMAP. Tissues collected so far have come from Barrow, Point Lay, Point Hope, Nome, St. Paul Island, English Bay, Cook Inlet, Prince William Sound, the Aleutian Islands, St. Lawrence Island, and Round Island. Marine mammals species sampled so far include ringed seals, bearded seals, beluga whales, bowhead whales, spotted seals, harbor seals, Steller sea lions, northern fur seals, Pacific walrus, and polar bears. Aliquots have been analyzed from a representative number of these samples.

Objectives The objectives of this study are to:

1. Collect tissues from Alaskan marine mammals for long-term cryogenic archival.
2. Determine and monitor levels of heavy metals, PAH's, and other contaminants associated with the oil and gas industry in marine mammals, with special emphasis on subsistence resources.
3. Monitor the condition of archived samples over time.

4. Develop new parameters and indices to describe contaminant burdens.
5. Relate contaminant burdens to human-health-risk assessment.

Methods Because only fresh specimens are considered suitable for the rigorous analysis protocol, the collection of marine mammal tissues is fully coordinated with Alaskan village subsistence hunters, who participate directly in the project. Native villages provide various forms of assistance to the tissue archival program, including participation in the tissue-collection and cryogenic-storage process.

Upcoming analyses will focus on methods for detecting current or recent contact with petroleum through (1) improved PAH testing, (2) increased collection of metabolite biomarkers in liver bile, and (3) comparisons with potentially associated levels of vanadium.

Products Annual reports and specimen inventories.

Importance to MMS Information from periodic analyses of aliquots from this tissue bank are increasingly used by Alaska Native groups to identify contaminants in their subsistence diet. The study provides additional baseline data in areas of interest to the gas and oil industry. Tissues collected in the Beaufort Sea will continue to help monitor postlease contaminant levels in subsistence-hunted species pursuant to offshore drilling operations for Lease Sales 71, 124, 144, 170, and 176. Continuity of funding for this study is considered critical to maintain previously collected tissues in cryonic storage.

Date Information Required: This continuation study is needed to support environmental assessment and exploration monitoring for past, ongoing, and upcoming offshore operations in Alaska planning areas. Data products and annual reports will provide critical and timely inputs to the environmental assessment process. The study will also develop information that addresses public concerns raised during outreach efforts.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Cooperative Agreement with CMI

Title: The Alaskan Frozen-Tissue Collection and Associated Electronic Database: A Resource for Marine Biotechnology

Actual Costs (in thousands)

Period of Performance: FY 1995-2001

FY1995 - \$30
FY1996 - \$31
FY1997 - \$32
FY1998 - \$75
FY1999 - -0-
FY2000 - -0-
FY2001 - -0-
Total Cost: \$168

Description:

Background The Alaska Frozen Tissue Collection (AFTC) collects animal tissues from a variety of species, thus addressing concerns of Alaskan Native subsistence hunters over possible contamination of food from various industrial sources. The AFTC has been collecting animal tissues for years, but it has been difficult to access the information on tissue analyses. The tissue inventory is fully computerized and, where available, shows latitudes and longitudes of collected specimens for potential GIS mapping.

Objectives The objectives of this study are to:

1. Expand the scope of the existing collection of tissues from marine mammals and other specimens of the Beaufort Sea, Cook Inlet, Shelikof Strait, and other planning areas.
2. Develop an electronic database that is accessible through the Internet, thus facilitating the transfer of information and sharing genetic resources among tissue investigators.
3. Ensure a long-term systematic record of frozen tissues from Alaska's marine ecosystems.

Methods Tissues and specimen data are collected by participating scientists from marine mammals, birds, fishes, and invertebrates. The AFTC coordinates with the ongoing MMS/BRD Alaska Marine Mammal Tissue Archival Project (AMMTAP), to collect additional marine mammal tissues from fresh carcasses using AMMTAP's cryogenic tissue-collection protocols.

Tissues are made available for contaminant and other types of analyses such as determination of the genetic status of harbor seals and other species. The study is developing an electronic database that is accessible through the Internet, thus facilitating the transfer of information among interested investigators.

Products Annual report and an electronic database.

Importance to MMS The sample size of marine mammals sampled for AMMTAP will be enlarged. More tissues from birds, fishes, and invertebrates from the Beaufort Sea will be available for analyses of industrial contaminants of interest to oil and gas development. This will permit enhanced postlease monitoring pursuant to Lease Sales 71, 124, 144, and 170 in the Beaufort Sea.

Date Information Required: This continuation study is needed to support environmental assessment and monitoring for ongoing and upcoming offshore operations in the Beaufort Sea. Data products and annual reports will provide critical and timely inputs to the environmental assessment process. The study also will develop information useful to enhancement of outreach efforts with local constituencies.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: Cooperative Agreement with ADF&G

Title: Monitoring Key Marine Mammals: Arctic

Actual Costs (in thousands)

Period of Performance: FY 1996-2000

FY1996 - \$368

FY1997 - \$ 10

FY1998 - \$182

FY1999 - \$ 0

Total Cost: \$560

Description:

Background Ringed seals have been identified as a “keystone” species in the Arctic marine environment. They represent a top-level predator in the food chain and an abundant species that occurs on the OCS year-around. Their distribution is affected by operations, and their abundance probably could be affected by a substantial oil spill. During 1985-1987 a program conducted by the Alaska Department of Fish and Game (ADF&G), with support from the MMS, developed a formal protocol for aerial surveys to monitor the distribution and abundance of ringed seals off the coast of northern Alaska. Using this protocol, ringed seal surveys were conducted during 1985, 1986, and 1987 along the Beaufort Sea coast. The 1989 monitoring report described their typical abundance and noted the range of natural variation. Since then, site-specific data have been collected during industry exploratory operations. All of this information was reviewed before additional monitoring surveys were conducted.

Objectives The objectives of this study are to:

1. Review and define the previously established protocol for monitoring ringed seals by aerial surveys.
2. Estimate relative abundance and density of molting ringed seals on fast ice in the Beaufort Sea during 1996-1998 and compare these estimates with data collected during 1985-1987.
3. Correlate ringed seal densities on fast ice with environmental parameters.
4. Determine abundance and density of molting ringed seals at and near industrial operations, and compare these with otherwise comparable nonindustrial areas.

5. Review adequacy of ringed seal data collected by past industry site-specific monitoring programs, and make recommendations for protocols to be used in future industry studies.
6. Provide reports of findings that result from ringed seal monitoring to local residents and subsistence users.

Methods Significant improvements over the established protocols for ringed seals 1985-1987 surveys will include navigation by Global Positioning System and direct computer entry of all sightings and other data. In the first year, data will be re-analyzed and monitoring protocols will be evaluated. Also, some aerial flights will be flown to test methods and to gather initial data on seal numbers in areas of industrial interest in the central Beaufort Sea. In the second year, extensive surveys will be conducted throughout the U.S. Beaufort Sea, evaluation of methods will continue, and analysis of seal distribution and abundance will begin. In years 3 and 4 surveys will again be conducted throughout the Beaufort Sea; and data analysis and reporting will be completed. Data from this study will be compared with the baseline data of previous studies.

Products Peer-reviewed scientific journal article. Final report.

Importance to MMS This study will provide a sound, scientific protocol for aerial surveys to evaluate ringed seals in the Beaufort Sea area. Updated information on important biological populations in proposed oil- and gas-lease-sale areas is used for EIS's and postlease assessments. Population estimates derived during this study facilitate postsale mitigation. The study will also provide information that addresses public concerns raised during outreach efforts.

Date Information Required: The products produced from this study could be used in the immediate future as they pertain to postlease Beaufort Sea Sale 144, for postlease permit approvals for Northstar and Liberty, and for the Beaufort Sale 176 EIS, scheduled for 2002.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information

Actual Costs (in thousands)

FY1997 - \$ 300

FY1998 - \$ 700

FY1999 - \$ 650

FY2000 - \$ 750

Total Cost: \$2,400

Period of Performance: FY 1997-2001

Description:

Background The extent to which the bowhead whale population utilizes OCS areas in the eastern Alaskan Beaufort Sea for feeding, as well as this area's importance to individual whales, is being studied to yield more definitive quantitative estimates. The study updates and improves on a major scientific report which estimated that the eastern Alaskan Beaufort Sea is not an important feeding habitat for bowhead whales.

Objectives The objectives of this study are to:

1. Collaboratively (with key stakeholders), design and conduct research appropriate for quantifying the importance of the eastern Alaskan Beaufort Sea as a feeding area for bowhead whales.
2. Analyze the literature and other available sources, including traditional-knowledge sources, for previous years and, where possible, test the above hypotheses for those years.
3. Update available information on disturbance to feeding bowhead whales.
4. Characterize the ambient acoustic environment in the eastern Alaskan Beaufort Sea and predict sound levels of oil-and-gas-industry activity received by potentially feeding whales.

Methods

Phase 1/Year 1 - Planning: The study contractor/cooperators conducted a workshop and series of subsequent project meetings that designed, refined, and recommended hypotheses for evaluating/estimating the importance of the eastern Alaskan Beaufort Sea as a feeding area for bowhead whales. Workshop and meeting attendees included representatives of the North Slope Borough (NSB), Alaska

Eskimo Whaling Commission (AEWC), Kaktovik Whaling Captains Association, MMS, National Marine Fisheries Service and an Inupiaq-language translator.

Technical activities considered by the group in Kaktovik, Alaska, included, but was not limited to: (1) analysis of the amount and condition of prey found in whale stomachs at Kaktovik and the stomach capacity of known-length whales (2) aircraft observation of area whale behaviors and any near-surface prey concentrations; (3) small-vessel plankton tows prior to and during the fall migration; (4) satellite imagery of relative marine-nutrient and other oceanographic conditions; (5) identification of bowhead feeding areas through analysis of radio-isotope ratios in the baleen; (6) computer modeling of feeding information to determine the relative importance of the eastern Alaskan Beaufort Sea to the bowhead whales; and (7) acoustic characterization of potential feeding areas in the eastern Alaskan Beaufort Sea and use of these data with existing noise-spreading models to predict sound levels received by feeding bowhead whales from hypothetical oil-industry noise sources at representative nearshore locations.

Proposed out-year research was subsequently presented to a Scientific Review Board (SRB) which included representatives from AEWC and NSB. The SRB concluded that a separate option for tracking bowhead whales using satellite tags, while not within the current budget, presented “a significant potential to provide information relevant to many questions concerning bowhead behavior and utilization (*i.e.*, residence time) of the eastern Alaska Beaufort Sea.”

Phase 2 - Field Work, Data Analysis, and Knowledge Synthesis: Research and field-season preparations for selected options are continuing over a 3-year period.

Products Field data summaries, annual reports, final reports, coordination, cooperation.

Importance to MMS The potential disturbance to bowhead whales by oil- and gas-industry activities and the importance of the eastern Alaskan Beaufort Sea to feeding bowhead whales were a partial basis for an MMS decision to adopt the Beaufort Sea Sale 144 Barter Island Deferral option. With additional information on the importance of the study area to feeding bowhead whales, alternative mitigation options for future Beaufort Sea lease sales may be feasible.

Date Information Required: Annual reports will be received before 2000 so that the information can be incorporated into the Beaufort Sea Sale 176 EIS. The final report is needed by year 2001.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Cooperative Agreement with CMI

Title: Correction Factor for Ringed Seal Surveys in Northern Alaska

Actual Costs (in thousands)

FY1998 - \$175
FY1999 - -0-
FY2000 - -0-
Total Cost: \$175

Period of Performance: FY 1998-2000

Description:

Background A protocol for monitoring ringed seal distribution and relative densities in Arctic waters has already been developed for MMS and implemented over 6 field seasons during spring basking periods when the greatest number of seals are hauled out on the ice. This study will augment previous monitoring by permitting estimation of true ringed seal densities based on the number visible from an airplane. Good information exists on ringed seal ecology and distribution in industrial versus control areas, but not enough to estimate true densities correctly. Correction factors developed for harbor seals have been found to be applicable to other years, as long as they and the survey estimates were developed in the same areas at similar times of the year. Most aerial surveys for ringed seals have attempted to standardize to late May to early June and to mid-day. The correction factor will facilitate re-analysis of historical data collected in GIS-compatible formats.

Objectives The goal of the study is to estimate a correction factor for the proportion of ringed seals not visible during aerial surveys and thereby, enhance the protocol for estimating Arctic ringed seal densities from aerial monitoring results. Useful quantitative information on ringed seal behavior will also be obtained, as identified in the methods section.

Methods Subnivean lairs will be located by dogs trained to alert handlers to ringed seal scents on command. Each year, the use of 20 subnivean lairs by seals will be monitored using air temperature recorded in lairs by thermistor sensors connected to data loggers. The cumulative frequency of lair use by date will be compared among years. During each aerial survey, the proportion of lairs still active will be calculated based on the temperature records. A sample of seals will be instrumented with radio- and ultrasonic-transmitters and their behaviors recorded by observers stationed on the ice surface. Ringed seals not visible during aerial surveys will be partitioned into those under the ice and those in subnivean lairs. Quantitative information will be obtained, including:

1. The temporal pattern in which ringed seals abandon lairs and begin to bask.
2. The proportion and variance of the out-of-water population of ringed seals concealed within subnivean lairs during aerial surveys.
3. The proportion and coefficient of variation of the population visible during aerial surveys.
4. The frequency distribution of distances traveled between winter home ranges and sites occupied during the spring basking period.
5. The relationships between date, distance to ambush cover, and group size for seals visible next to basking holes and cracks.

Products The study will provide ground-truth for the location of haulout episodes by radio-tagged seals and determine the location of all area haulout sites, whether or not they coincide with strip transects surveyed during aircraft overflights. Products include a final report, peer-reviewed journal articles, and digital data.

Importance to MMS Offshore production of oil in the Beaufort Sea is planned for the Northstar and Liberty. Post-lease undersea-pipeline construction is expected to result in additional acoustic and visual disturbance of ringed seals in marine areas due to increased vessel and helicopter traffic. Such disturbance has the potential for causing some long-term abandonment of industrial areas. Providing a means to determine the true densities of seals observed in aerial monitoring will help us estimate the number of seals affected by such industrial activity. Also, estimates of absolute population size require a correction factor for the proportion of seals not visible during surveys.

Date Information Required: Study information will be used for the Liberty Development and Production Plan EIS.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: Interagency Agreements with USGS Biological Resources Division

Title: Polar Bear Den Surveys

Actual Costs (in thousands)

FY1999- \$ 40

FY2000- -0-

FY2001- \$240 to \$360

Total Cost: \$280 to \$400

Period of Performance: FY 1999-2001

Description:

Background Two stocks of polar bear inhabit the Arctic OCS region. The Beaufort stock is shared with Canada and dens partly in the eastern Alaskan Beaufort Sea. Remote sensing of polar bear dens might be more reliable and safer than ground surveys. Aerial denning surveys would provide a measure of reproductive effort and success, and an index to population trends. Such surveys in prospective exploration areas could provide information for avoiding site-specific effects. A scientifically valid estimate of the Chukchi/Bering Sea population size is not currently available and current information on the population dynamics of the polar bear population is incomplete. The USGS-BRD, USFWS, and Russian scientists have conducted previous surveys of polar bear dens. Past survey efforts have been complicated by inconsistencies in survey methodologies, timing, and location and by the large variation in den estimates.

Objectives The goal is to reliably identify subnivean polar bear dens along the North Slope of Alaska. Specific objectives are to:

Phase I

1. Test forward-looking infrared (FLIR) imaging devices from aircraft near Prudhoe Bay, Alaska.
2. Conduct a workshop to evaluate the effectiveness of FLIR imagery in detecting subnivean polar bear maternal dens.

Phase II (depending on the success of Phase I)

1. Develop a valid repeatable aerial remote-sensing protocol for surveying polar bear dens.

2. Use the protocol to identify polar bear denning sites along the eastern Alaskan Beaufort Sea and correlate with habitat features.

Methods Phase I of a study will test and evaluate FLIR technology for conducting effective polar bear den surveys. The evaluation will take place at a workshop in Anchorage where participants would score FLIR aerial videography (recorded during January denning) and discuss the applicability of remote sensing methods and equipment for identifying polar bear dens. The proceedings of this workshop and an evaluation of the success of the FLIR technology for detecting polar bear dens will be published as an interim report. Depending on the success of Phase I, Phase II would further develop (and possibly purchase) appropriate remote sensing technology and design a repeatable survey protocol for surveying polar bear dens. Working cooperatively with the Fish and Wildlife Service, the protocol will then be used the following winter to catalog polar bear denning sites, correlating them with denning habitat features and ambient observational conditions in the eastern Alaskan Beaufort Sea. The final report would include the revised final protocol and appropriate analyses of survey results.

Products Interim report, final report, peer-reviewed journal articles, digital data.

Importance to MMS During the environmental review for Lease Sale 170 and the Warthog exploration plan, public concern was expressed regarding the environmental sensitivity of the eastern Alaskan Beaufort Sea and the lack of comprehensive biological baseline information. Information from the den surveys will be useful in decisions regarding mitigation measures. Population-dynamics information would be useful in assessing the effects of development, including habitat alteration, modification, and potential spills on the polar bears of this region. Also, since the Chukchi/Bering stock of polar bears is a shared population between the U.S. and Russia, where most denning occurs on Wrangel Island, Herald Island, and the Chukotka Peninsula in Russia, technology developed here would permit future joint U.S.-Russia den surveys of the Chukchi/Bering Sea population, developing valid statistical estimates of population status and trends.

Date Information Required: There is a need for information to monitor polar bear population trends and reproductive effort/success, and to assess potential impacts associated with potential offshore operations. If Phase II is implemented, study information will be used for the Liberty Development and Production Plan EIS and related monitoring baseline.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: USGS Biological Resources Division

Title: Simulation Modeling of the Effects of Arctic Oil Spills on the Population Dynamics of Polar Bears

Actual Costs (in thousands)

Period of Performance: FY 1999-2000

FY1999 - \$150 (BRD)

Total Cost: \$150 (BRD)

Description:

Background The USGS-BRD maintains a large dataset on polar bear distribution in Arctic waters. The MMS has an arctic oil-spill trajectory model which is used each time there is a Beaufort Sea Environmental Impact Statement. The study would be coordinated as appropriate with MMS oil-spill modelers. A great deal is already known about the distribution and movements of polar bears in Alaska OCS Beaufort Sea planning areas through an ongoing program of satellite tagging and tracking conducted by USGS-BRD. The MMS already has an updateable oil-spill model for the Beaufort Sea. Information is also available on the potential effects of oil on individual polar bears.

Objectives The goal is to predict the effects of hypothetical Beaufort Sea oil spills and other postulated mortality on the population recovery of polar bears. Specific objectives are to:

1. Develop/refine an independent, conceptual, polar bear population-dynamics model for Alaskan waters, with assumptions and initial conditions that can respond to hypothetical removals. Conduct a sensitivity analysis of this model.
2. Produce an interactive model compatible with MMS hardware and software standards at the time of completion and a users manual for testing revised data input and model assumptions as may be appropriate for future lease sales.

Methods This project will develop a model of polar bear population dynamics to simulate population-level recovery from hypothesized removals due to potential oil spills, and will establish mechanisms for linking such model with the MMS Oil Spill Risk Analysis (OSRA) model trajectories for the Beaufort Sea. The completed model will include appropriate computer programs and existing algorithms on polar bear life history, population dynamics, and known seasonal distribution in Arctic waters, based primarily on existing satellite-tracking data on polar bears collected by USGS-BRD. Hypothesized mortality and population recovery of both Beaufort and Bering/Chukchi Sea populations of polar bears

in response to Beaufort Sea oil spills and other postulated mortality would be modeled. The interactive model and a user-friendly manual shall be explained and demonstrated to MMS biologists for their use in varying data input and model assumptions as appropriate for future lease sales.

Products Final report, interactive computer model, user-friendly manual, peer-reviewed journal articles, digital data compatible with MMS TIMS/ArcInfo formatting.

Importance to MMS Polar bears, which are hunted for subsistence, are known to be highly sensitive to direct oiling. Some subsistence hunters and environmental groups previously expressed opposition to lease sales that might adversely affect polar bears. The study will enhance MMS's ability to predict the effects of a potential oil spill in the Beaufort Sea on large concentrations of polar bears such as those that den on Wrangel Island or that congregate near bowhead whale carcasses. The study will be beneficial in implementing the existing stipulation on protection of biological resources. The study will develop information that addresses public concerns raised during previous outreach efforts.

Date Information Needed: Study information will be used for the Liberty Development and Production Plan EIS.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Cook Inlet

Type: Cooperative Agreement with CMI

Title: An Economic Assessment of the Marine Sport Fisheries in Lower Cook Inlet

Costs (in thousands)	Period of Performance: FY 1997-2000
FY1997 - \$141	
Total Cost: \$141	

Description:

Background The marine sport fisheries of lower Cook Inlet are the focus of a rapidly expanding tourist economy. Sport fisheries produce nonmonetary benefits to fishermen and monetary benefits to tourism-related businesses. The sport fisheries of lower Cook Inlet contribute to the economic well-being of residents of the Kenai Peninsula, Alaska, and the nation. While there is considerable information regarding the economic value and impact of commercial fisheries off Alaska, the economic value and impact of sport fishing activities have not been rigorously evaluated.

Objectives The objective of this study is to produce an econometric model that is capable of analyzing the effects of changes in the sport-fishing opportunity on angler net benefits and ultimate impact of those changes on the regional economy through evaluation of various scenarios. This in turn will provide the capability to analyze potential effects of OCS lease-sale and postlease activities.

Methods The Impact Analysis for Planning econometric model (IMPLAN) will be used initially. The IMPLAN database and model has been modified for use in regional analysis of the Kenai Peninsula region. A series of focus-group meetings were held in communities on the Kenai Peninsula in conjunction with other community-research methods as deemed necessary. Following verification and ground-truthing of the IMPLAN Kenai Peninsula model now completed, necessary information will be extracted for use in the Fishery Economic Assessment Model (FEAM). Disaggregation of commercial- and recreational-fisheries-related sectors will occur during this step. Impact analysis will be performed to estimate direct, indirect, and induced effects on income and employment by industry and aggregated industries. A regional input/output model will measure the impact of marine sport fisheries on the Kenai Peninsula economy.

Products Documentation of the complete input/output model and an econometric description of the contingent-valuation-method model, final report, peer-reviewed publications, oral presentations for interested groups on request, and journal article.

Importance to MMS Leases held in Cook Inlet are located in and near productive commercial, subsistence, and sport-fishing grounds. OCS exploration, development, and production activities could affect the sport-fishing and related sectors of the regional economy, the quality of sport-fishing recreational opportunities, and the demand for tourism-related services. This study will provide improved analytic tools to assess potential impacts and to make decisions to mitigate potential impacts.

Date Information Required: The information is required for environmental assessment related to activity on Cook Inlet leases and an EIS for a possible lease sale in the Oil and Gas Leasing Program 2003 to 2008.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: *Exxon Valdez* Oil Spill, Cleanup, and Litigation: A Community-Based Collection of Social-Impacts Information and Analysis, 1989-1996

Actual Costs (in thousands)

FY1997 - \$123

FY2000 - \$ 30

Total Cost: \$153

Period of Performance: FY 1997-2000

Description:

Background The oil spill from the *Exxon Valdez* grounding not only contaminated natural habitat and resources but also produced a cleanup effort that was a major causal agent for ongoing social impacts among communities in Southcentral Alaska. The effects from the oil spill, cleanup, and subsequent litigation have been documented variously in media coverage and by research initiated by MMS, the Alaska Conference of Mayors, the State of Alaska, Federal resource and response agencies, academic institutions, and individual researchers. The level of information regarding the changes in the human environment related to the *Exxon Valdez* oil spill, cleanup, and litigation is varied—without a comprehensive formal, comparative, quantitative, and qualitative analysis of existing data, this information is of limited use to decision makers.

Objectives The objectives of this study are to:

1. Collect, organize and synthesize all community-based social information associated with the *Exxon Valdez* oil spill, cleanup, and associated litigation for the period 1989—the year of the spill—through the date this contract is awarded that shows the effects on the human environment.
2. Identify key social factors and analyze the literature by these factors showing effects resulting from the *Exxon Valdez* oil spill, cleanup, and litigation. The Contractor was required to solicit input and concurrence of the key social factors from representatives of MMS, the State of Alaska, local communities, and Native organizations.
3. Prepare a CD-ROM, which is PC-based, containing an annotated bibliography, abstracts, social factors, analytical findings of this study, and source documents.

Methods A formal, comparative quantitative and qualitative analysis of existing data that documents changes in the human environment related to *Exxon Valdez* oil spill, cleanup, and litigation was conducted. Social factors important to understanding and analyzing the community-based social effects resulting from the *Exxon Valdez* oil spill, cleanup, and litigation were identified. At a minimum, these social factors include social organization (including kinship networks), cultural values, social health, access to subsistence resources, subsistence hunting, and the use of subsistence resources. Pertinent literature was analyzed and the effects of the *Exxon Valdez* oil spill, cleanup, and litigation were evaluated according to the social factors. This evaluation was cross-referenced by social factor, literature source, and community. Findings from the study “Sociocultural Consequences of Alaska OCS Activities: Data Analysis and Integration” will be added to the CD ROM in FY 2000. The final products of this study (annotated bibliography, abstracts, social factors, and a summary of the analytical findings) will be entered on the CD-ROM, which is PC-based. The CD-ROM is intended to be publicly available and can be queried on social factors, key words, author, title and community.

Products A CD-ROM that is PC-based, containing an annotated bibliography, abstracts, social factors, and a summary of the analytical findings of this study. Peer-reviewed journal article.

Importance to MMS The reason for doing this study was to learn, in a structured way, the localized social effects from spilled oil, cleanup, and litigation on the coastal communities of Alaska. The MMS foresees using the products of this study to assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, outreach with coastal communities regarding the MMS program, and review and formulate offshore policy for Alaska. Providing an analytical tool for our staff and to the public would benefit our difficult task of gaining public support for the MMS mission regarding offshore Alaska.

The process and products from this study may serve as a prototype for similar future data synthesis of large information databases. While this study focuses on social information of the *Exxon Valdez* oil spill, similar tasks could be applied to the physical and biological sciences.

Date Information Required: These deliverables provide pre- and postlease information for the Beaufort Sea Sale 176 EIS, the Liberty DPP EIS, ongoing outreach efforts, and future socioeconomic-study proposals.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Contract

Title: Collection of Traditional Knowledge of the Alaskan North Slope

Actual Costs (in thousands)

Period of Performance: FY 1997-2000

FY1997 - \$125

FY1998 - \$125

FY1999 - \$125

Total Cost: \$375

Description:

Background The Native people of Arctic Alaska have many years of experience in living in Arctic environments and have much knowledge on the biological and physical environment of both the marine and terrestrial ecosystems. Much of this knowledge has been passed on from one generation to the next by word of mouth. Little of it is in published form and even less is indexed. Much traditional knowledge has, however, been written, audio-recorded, archived and, in some cases, published. But because there is no index of this traditional knowledge, it is often not available to the scientific community. This information has not been collected, indexed, or fully abstracted. Because of this, much traditional knowledge has not been readily available to the scientific community. Potential closure of the BIA ANCSA Office could leave the 8,000 interview files unavailable.

Objectives The objectives of this study are to:

1. Locate, collect and organize all “traditional-knowledge” information associated with the Alaska North Slope Borough (NSB), encompassing oral-history-taped interviews, written transcripts, published sources, and textual and video records including any CD-ROM “jukeboxes” produced for the North Slope Borough (NSB) by the Alaska Oral History Project at the University of Alaska-Fairbanks (UAF) of elder interviews and Elders’ Conferences and the Bureau of Indian Affairs (BIA) Alaska Native Claims Settlement Act (ANCSA) Office Native-allotment-interview files (8,000).
2. Identify key traditional-knowledge indices for structuring and abstracting.
3. Prepare a PC-based CD-ROM containing an annotated bibliography, abstracts, traditional-knowledge indices and findings of this study.

4. Prepare an Inupiat epistemology.

Methods Identified traditional-knowledge sources would be judged appropriate for inclusion in the traditional-knowledge database based on a review by community elders, subsistence coordinators on staff with the NSB, Inupiaq Language and Cultural Center personnel, Inuit Circumpolar Conference, and members of the North Slope Scientific Committee. The identified information would be indexed and, with an annotated bibliography and abstracts, placed on a CD-ROM. The CD-ROM would be disseminated to Native communities and State of Alaska, Federal, and local governments involved in environmental research and assessment. At a minimum, the proposed database would encompass subsistence areas; harvest methods; relationships between physical environment and animal populations and behavior; bowhead whale behavior, movement, and distribution; ice conditions and movement; wind patterns; current patterns; and place-name information.

Products A PC-based CD-ROM containing an annotated bibliography, abstracts, traditional-knowledge indices, the findings of this study, and an Inupiat epistemology. A peer-reviewed journal article.

Importance to MMS Public input has very strongly recommended that MMS and other government agencies incorporate traditional Native knowledge in our documents. The products of this study will be used to assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska. While this study focuses on the North Slope, the process used could serve as a prototype for a similar study in all areas of Alaska.

Date Information Required: Deliverables are due to MMS periodically through the 3-year performance period of this study. These deliverables will provide information for the Beaufort Sea Sale 176 EIS, the Liberty Development and Production Plan EIS, ongoing outreach efforts, and future socioeconomic-study proposals.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Publication of a Book/Synthesis on the Socioeconomic Effects of Oil and Gas Industry Activity on the Alaska OCS

Actual Costs (in thousands)

Period of Performance: FY 1998-2000

FY1998 - \$349

Total Cost: \$349

Description:

Background The Alaska OCS Region has implemented an important socioeconomic component of its overall Environmental Studies Program, resulting in the publication of more than 160 Technical Reports (TR's) addressing statewide socioeconomic study topics. Methodologies have included case studies, institutional profile analysis and analysis of secondary-source materials, modeling and econometrics analysis, and survey research. In recent years, socioeconomic studies have become more focused and issue-oriented, emphasizing the critical points between OCS development and social systems with which potential development would interact. For example, studies have collected time-series information and measures of community and regional well-being as bases for social-indicators monitoring.

Considering the extent of MMS's social research in Alaska and the substantial information accumulated, a workshop examining the usability of the current research in its original forms versus the costs and benefits of further synthesis was recently conducted. In planning for the preparation of a useful resource document resulting from the workshop efforts, the workshop participants identified a tentative outline, chapter integration, and potential co-sponsors.

The level of information regarding changes in the socioeconomic environment related to OCS activities is varied—without a comprehensive formal, comparative, quantitative, and qualitative documentation of existing data, this information is of limited use to decision makers.

Objectives The objective of this study is to coordinate and prepare a peer-reviewed book/synthesis of available information about the potential socioeconomic effects of oil- and gas-industry activity on the Alaska OCS.

Methods The study would finalize the book/synthesis outline; integrate chapters; identify the author; and solicit potential co-sponsors. MMS funded studies will be the primary source of reference materials plus subsequent studies that were initiated from these findings. To be considered as source material, the

literature must be related to oil and gas activities in Alaska and peer-reviewed. The topics to be addressed will be narrowed specific to the information available through this literature search which will also serve to identify potential authors. These authors may also identify additional sources of information for synthesis.

Products A published book on the socioeconomic effects of oil and gas industry activity on the Alaska OCS.

Importance to MMS Throughout Alaskan coastal communities there are socioeconomic-related issues resulting from those who favor resource development and those who want no risk of resource development. This study will provide a peer-reviewed synthesis of current information for use in decision making. The MMS foresees using the products of this study to assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, outreach with coastal communities regarding the MMS program, and review and formulate offshore policy for Alaska.

Date Information Required: The study will provide information for the Beaufort Sea Sale 176 EIS, the Liberty DPP EIS, ongoing outreach efforts, and for future socioeconomic-study proposals.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Competitive

Title: Update Oil Industry Labor Factors for Alaska Manpower Model

Actual Costs (in thousands) **Period of Performance:** FY 1998-2000
FY 1998 - \$132
Total Cost: \$132

Description:

Background The Manpower Model was created in the late 1970's and early 1980's to project the number of workers directly employed in proposed OCS exploration and development activities. This data is used in another model to predict secondary employment and population. The employment data from the Manpower Model and the secondary employment and population data are used in EIS's. The input factors to the Manpower Model were based on information, no more current than the early 1980's, from industry on the actual number of workers used for 20 different tasks and numerous subtasks through the full range of activity from exploration and development to production. Technology has changed sufficiently that the input variables to this model should be re-examined and adjusted. The employment and population projections in recent EIS's do not reflect current industry practices and technology. Information about current industry practices is best obtained from industry representatives and consultants to industry.

Objectives The objective of this study is to update the Manpower Model with input variables that accurately reflect the number of workers needed to complete tasks associated with exploration, development, and production on the OCS.

Methods Industry representatives and, possibly, other knowledgeable sources will be interviewed to determine the actual number of oil and gas industry workers and amount of time needed to complete the tasks and subtasks defined in the Manpower Model. These updated oil- industry-labor factors will be input to the Manpower Model. The Manpower Model will be tested to ensure it is functioning properly with the updated factors. The current Manpower Model has one set of factors for all of Alaska. The update will be for Arctic operations only.

Products Products will be labor factors for the Manpower Model that are updated through 1997, reflecting most current industry practices and technology for Arctic offshore operations. The Manpower Model will be updated with the updated labor factors. The Manpower Model will be tested to ensure proper functioning. A peer-reviewed journal article will be submitted.

Importance to MMS Projections of direct OCS employment, secondary employment, and population in Arctic region EIS's will be more accurately reflected. With more accurate projections, stakeholders will have more confidence in the economics sections of the EIS's. More accurate projections may be used in decisions regarding postlease mitigation.

Date Information Required: This information will be useful for EIS's for lease sales in the Arctic in the 1997-2002 5-year program.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-02

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Regional Economic Impact Analysis of Subsistence Bowhead Whaling:
Accounting for Non-Market Activities on Alaska's North Slope

Actual Costs (in thousands)	Period of Performance: FY 1999-2001
FY 1999 - \$115	
FY 2000 - \$92	
FY 2001 - \$89	
Total Cost: \$296	

Description:

Background Subsistence activities by Inupiat of the North Slope including whaling are difficult for contemporary western researchers to evaluate or to quantify. Two economic theories, home production theory and regional, input-output modeling (IMPLAN) are appropriate for policy and resource development analysis in Alaska and analysis of the economics of subsistence whale harvest. Using these two theories and gathering data to apply to the theories can help answer questions more precisely about the economics of subsistence whale harvest. Barrow, Nuiqsut, and Kaktovik are the primary communities where subsistence whale hunting is done that potentially could be impacted by OCS activities in the Beaufort Sea.

Objectives The overall objective of this study is to provide community economic profiles and a working regional economic model for the communities of Barrow, Kaktovik, and Nuiqsut.

Methods The methods of this study are:

1. Obtain approval of the Barrow, Kaktovik and Nuiqsut communities to gather data and do the study. Only when the three communities approve the project will the remaining steps of the study proceed.
2. Update the IMPLAN database to accurately reflect the Barrow, Kaktovik, and Nuiqsut cash economies.
3. Determine a format for collection of information concerning the household economy from stakeholders in collaboration with representatives of the three communities.

4. Obtain information concerning the household economy from the primary stakeholders through focus groups.
5. Draft a survey questionnaire and obtain approval from the Office of Management and Budget.
6. Obtain information regarding the household economy from the community using a survey questionnaire.
7. Modify and test the IMPLAN Model and develop the Community Profile.

Products Quarterly and annual reports. Presentations to CMI and MMS annually and presentations to Barrow community at beginning and end of study and others for groups requesting presentations. Modified IMPLAN Model and home production functions. Technical summary and non-technical summary for the public not conversant in technical language of the study. Peer-reviewed journal article. Draft final report and final report including methodology.

Importance to MMS MMS can use the modified IMPLAN model to predict potential impacts in pre-lease and pre-development environmental impact statements. This project can also provide an important baseline assessment for future comparisons. Application of the Model to subsistence bowhead whaling off the north coast of Alaska, specifically the Beaufort Sea, will depict the unique features of this cash/non-cash economy. Working in partnership with the North Slope Borough Department of Wildlife Management and the Barrow, Kaktovik, and Nuiqsut communities will assure accurate and reliable information and ownership of the model by community members. This study will provide comprehensive economic methodologies depicting non-formal, subsistence sectors prevalent in rural Alaska economies.

Date Information Required: This information will be used for post-lease environmental assessments after Beaufort Lease Sale 176 scheduled for 2002 and for lease sale EIS's in the Beaufort Sea which will probably be scheduled in the next Five-Year Program.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Reference Manual and GIS Overlays of Oil-Industry and Other Human Activity (1970-1995) in the Beaufort Sea

Actual Costs (in thousands)

FY1998 \$106

FY1999- \$150

Total Cost: \$256

Period of Performance: FY 1998-2000

Description:

Background Analysis of the potential effects on wildlife of oil-industry and other human activities has been limited by the quality and resolution of data available on these activities. This study will provide wildlife scientists, Native organizations, and others with the authoritative historic information on human activity needed to analyze the potential effects of such activities on whale migrations, wildlife distributions, shipwrecks, etc.

Objectives The objectives of this study are to:

1. Quantify offshore drilling, seismic exploration, vessel- and helicopter-support activity in the Beaufort Sea in small units that are comparable between areas and years (e.g., line miles shot by area).
2. Quantify other human activity in the Beaufort Sea such as number and types of commercial vessels, subsistence hunting, and aircraft on an annual basis, specifying when and where such human activity occurred.
3. Compile measures for the above human activities in an interyear, cross-indexed reference manual and as ARC/INFO overlays—both useful for defining “industrial” versus control zones, in identifying between-year trends, and in comparing levels of various types of oil- industry activity with other human activities and wildlife distributions.

Methods An inventory will be made of all published and unpublished records of oil industry activities in Federal and State waters by year for the period 1970 to 1995 in the Alaskan Beaufort Sea. Records inventoried will include, but are not limited to, Federal, State, oil industry, and oil-industry-support entities. All legally available and nonproprietary records on vessel and on-ice seismic, drilling,

production, and support activities will be compiled and synthesized by area, month, and year. A similar inventory of other vessel and low-level aircraft activity in or over the Beaufort Sea will be conducted.

The levels for each human activity will be described in the smallest units possible to facilitate subsequent temporal and spatial comparisons between areas, months, and years.

This study will compile measures appropriate to each human activity in an interyear (1970-1995), cross-indexed reference manual that includes a summary ARC/INFO overlay for each activity during each month and each year.

Products Oracle/SDE geospatial database, users and reference manuals, training.

Importance to MMS Information from this study will be valuable to the consultative process under the existing stipulation on subsistence whaling and other subsistence activities (Stipulation No. 5, Sale 144). The study will provide the most authoritative source of oil-industry and other human geospatial activity available for the Beaufort Sea during the years 1970-1995. It would address in greater detail many of the concerns about oil-industry activity raised by non-industry groups relative to potential interference with subsistence hunting and whaling. Results of this study will be used to help resolve long-standing concerns over the potential effects of seismic activity.

Final products from the study will be important to decision makers, managers, and scientists for:

1. Making direct comparisons between oil-industry activities and the distribution of wildlife species (bowhead whale migrations, waterfowl, ringed seals) previously monitored in the Beaufort Sea.
2. Comparing drilling activity with monitored water chemistry and chemical contaminants found in archived marine-mammal tissues.
3. Determining potential effects on wildlife by better defining, delineating, and quantifying appropriate industrial-activity and control zones.

Date Information Required: This information is needed for evaluation of postlease exploration plans in the Beaufort Sea and to improve present and planned monitoring of the potential impacts of postlease activity on bowhead whales, ringed seals, and marine mammal tissues in the Beaufort Sea (respective to Sales BF, 71, 124, 144, 170, and 176).

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive

Title: ANIMIDA - Arctic Nearshore Impact Monitoring In Development Area

Estimated Costs (in thousands)

Period of Performance: FY 1999-2004

FY1999 - \$517

FY2000 - \$600 to \$900

FY2001 - \$600 to \$900

FY2002 - \$600 to \$900

FY2003 - \$240 to \$360

Total Cost: \$2,240 to \$3,660

Description:

Background Residents of the villages of Nuiqsut, Kaktovik and Barrow are particularly concerned about long term effects of offshore developments at Liberty and Northstar as well as long term effects of any development from Lease Sales 170 and 176. Interagency reviews of related EIS's and Development and Production Plans recommend monitoring impacts of Northstar and Liberty. Current information on selected topics is available but likely to be out of date or not of sufficient geographic or seasonal focus to meet the needs of this effort.

This study gathers long term monitoring data which will provide a basis of continuity and consistency in evaluation of potential impacts from site-specific, upcoming development and production in the Beaufort Sea. Priority monitoring issues are being determined through public and interagency comment, and coordinated with lessees and other organizations.

Objectives Due to the scale and scope of this study, the objectives are phased.

Objective 1 - Year 1/Phase 1: Environmental Baselines:

1. Perform a brief and focused literature review for the Liberty and Northstar areas.
2. Initiate baseline efforts on underwater noise and vibration, sediment quality, and resuspension/deposition.
3. Coordinate the above baseline efforts with any ongoing or previous applicable MMS or industry site specific monitoring.

Objective 2 - Years 2 - 5/Phase 2: Integrated Physical, Chemical, Biological, and Subsistence Impact Monitoring in Nearshore Development Area:

1. Detailed interdisciplinary monitoring objectives, with increased scope to include future key impact receptors will be identified by December, 1999 following available comments for Northstar and Liberty EIS's. It is anticipated that specific living resource and socioeconomic components such as benthic/kelp communities, local vertebrate populations, and local subsistence harvest/use patterns will be included.
2. Compile future monitoring results into statistical, graphical/mapped, and other formats of spatial, temporal, and pattern analysis useful to decision making and operational evaluation.

Methods The first year, Phase 1, will be a near-term focused literature review, planning, and baseline effort focused on key physical environmental factors which are known to significantly inter-relate with sensitive biota or other valued resources. Anticipated field logistics necessary to complete objectives include limited fixed-wing aircraft and/or helicopter support in ice-covered seasons and fixed-wing aircraft and small vessel (e.g. MMS Launch 1273) support in the "open" water season. Phase 2 (FY's 2000-2003) will be specific interdisciplinary monitoring components for which key objectives and similar logistics will be determined following public comment on Northstar and Liberty. It is anticipated that specific biological monitoring methods for application to benthic/kelp communities, localized vertebrate populations, and subsistence use patterns will be included. Noise propagation modeling, animal movement and behavior, traditional knowledge sources and other tasks will be integrated. Year 5 (FY 2003) will be devoted to reporting of monitoring results.

Products Literature review and reports of results of physical environmental monitoring for FY 1999. Draft and final annual reports on monitoring accomplished each year for FY's 2000-2002. Comprehensive Final Report of monitoring results for entire study sequence.

Importance to MMS Permit decisions have been made for made for Northstar in 1999. The DEIS for Liberty will be released in mid-2000. Development of these Units are generating public concerns regarding impacts on nearshore biota.

Date Information is Required: The initial literature search and optimized physical environmental monitoring will be done in FY 1999-2000. Interdisciplinary monitoring will be carried out in FY 2000-2002. The final monitoring report should be done in FY 2003. Production from the Northstar Unit is scheduled for 2001 and from the Liberty Unit in 2003.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort and Chukchi Seas

Type: Contract

Title: Estimation of OCS Oil Spill Risk from Alaska North Slope, Trans-Alaska Pipeline, and Arctic Canada Spill Data Sets

Actual costs (in thousands)

Period of Performance: FY 1999-2000

FY 1999 - \$95

Total Cost: \$95

Description:

Background The historical record for the OCS statistics used to calculate the national OCS oil spill rates is mostly from the Gulf of Mexico. This spill record does not include pipeline spills inshore of the OCS, in State waters or on land. The MMS Alaska OCS Region intends to calculate spill frequency based on the Alaska North Slope and Arctic Canada rather than on the Gulf of Mexico experience, and to include all major pipeline spills, both onshore and offshore, in environmental impact assessment. This study is the first step in this process and will collate available information on oil industry spills of ≥ 100 bbl in the Alaska North Slope and Arctic Canada, verify spill information for the larger spills (≥ 500 bbl), and estimate provisional spill rates for use for the Liberty EIS.

Objectives The objectives of this study are to:

1. Obtain and collate data on oil industry spills of ≥ 100 bbl.
2. Review data reliability and completeness.
3. Obtain and collate crude oil production, pipeline throughput, and pipeline mileage data by year.
4. Evaluate appropriateness and statistical robustness of the oil spill data for estimating spill risks and provide provisional spill rate estimators.

Methods The methods of this study are to:

1. Contact appropriate regulatory agencies for oil industry spills in study subareas. Supplement as necessary with review of primary spill files and industry contacts. Review reporting criteria in effect at time spill was reported and validate data for found spills with the authority to whom spills are required to be reported. For spills of at least 500 bbl, evaluate the reliability of reported spill volumes based on supporting documentation.

2. Obtain and collate any crude production and piped crude and diesel volumes by year for the study subareas. Also collate operational pipeline mileage in place each year.
3. Determine optimum data set based on statistical analysis and prior MMS use. Estimate draft onshore plus offshore spill rates using the optimum data set.

Products Updated oil spill database, final report

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EIS's, environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EIS's in the Alaska OCS Region. The inability to factor in spill frequency for different length pipelines makes it difficult to evaluate value of alternative pipeline routes in development EIS's. The MMS has made a commitment to use Alaska-relevant spill rates in the forthcoming Liberty EIS. This study provides that information.

Date Information Required: Information from this study will be used to provide the oil spill rates for the Liberty EIS and are needed by early winter in 1999-2000.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas

Type: Competitive

Title: Alternative Oil Spill Occurrence Estimators for the Beaufort/Chukchi Sea OCS

Estimated costs **Period of Performance:** FY 2000-2001

FY 2000 - \$80 to \$120

Total Cost: \$80 to \$120

Description:

Background The historical record for the OCS statistics used to calculate the national OCS oil spill rates is mostly from the Gulf of Mexico. This spill record does not include pipeline spills inshore of the OCS, in State waters or on land. The MMS Alaska OCS Region intends to calculate spill frequency based on the Alaska North Slope and Arctic Canada rather than on the Gulf of Mexico experience, and to include all major pipeline spills, both onshore and offshore, in environmental impact assessment. The first step in this process was a preliminary study in FY 1999-2000 to collate readily available information on oil industry spills of ≥ 100 bbl in the Alaska North Slope and Arctic Canada, verify spill information for the larger spills (≥ 500 bbl), and to estimate provisional spill rates for use in the nearshore Beaufort Sea OCS.

The premise of this preliminary study was that in the nearshore, pipeline and platform spill rates can be extrapolated from the Alaska and Arctic Canada onshore oil spill experience. The validity of this premise cannot be assumed for locations further from shore that might be offered in future oil and gas lease sales.

Objectives The objectives of this study are to:

1. Provide statistical support to MMS in evaluating best statistical methods to estimate oil spill rates.
2. Evaluate the applicability of the results from the preliminary study to deeper tracts that could be offered in Sale 176 or in subsequent sales.
3. Evaluate alternative approaches to estimating oil spill risk for Beaufort Sea lease sales.

Methods The methods of this study are:

1. Twenty hours on-call statistical support to MMS staff developing Alaska-specific oil spill rates will be provided.
2. The spill data from the preliminary study and environmental exposure issues for the <200-m deep portion of Beaufort Sea Planning Area will be reviewed. The relevance of the spill data to areas in waters deeper than 20 miles will be evaluated.
3. There are alternate approaches that can be used to estimate spill rates in the absence of sufficient historical data. Alternative oil-spill frequency estimators suitable for predictive use in Beaufort and Chukchi Sea OCS will be evaluated, both in exploration and development phases. Draft oil spill rates based on the most appropriate estimators will be provided. The study will also quantify robustness of the statistics (Confidence Limits on spill frequency estimates), and quantify precision/variance of estimates of spill probabilities.

Products Final report.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EIS's, environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EIS's in the Alaska OCS Region.

Date Information Required: Information from this study will be used by Alaska OCS Region staff in preparing the Sale 176 EIS, in preparing future developmental EIS's, and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Cooperative Agreement with University of Alaska, Fairbanks

Title: Minerals Management Service/University of Alaska-Fairbanks/State of Alaska/Coastal Marine Institute - Management

Actual Costs (in thousands)

Period of Performance: FY 1994-2003

FY 1993 -	\$ 32
FY 1994 -	\$ 110
FY 1995 -	\$ 86
FY1996 -	\$ 100
FY1997 -	\$ 104
FY1998 -	\$ 101
FY1999 -	\$ 100
FY2000 -	\$ 100
FY2001 -	\$ 100
Total Cost:	\$ 833

Description:

Background This study provides management of a large ongoing program of scientific research into framework issues related to lease sales scheduled in the OCS 5-year leasing program. It is a cooperative program between MMS and the University of Alaska, with State of Alaska participation. The Coastal Marine Institute (CMI) is expected to leverage additional scientific results and logistics capability at levels comparable to the MMS contribution. The Coastal Marine Institute will update and expand our understanding of OCS environmental information and address future needs related to the offshore oil and gas program in Alaska.

Objectives The purpose of the CMI is to generate scientific information for MMS and State of Alaska decision makers that is consistent with the needs outlined by the Framework Issues. The Framework Issues are:

1. Scientific studies for better understanding marine, coastal or human environments affected or potentially affected by offshore oil and gas or other mineral exploration and extraction on the Outer Continental Shelf (OCS).
2. Modeling studies of environmental, social, economic, or cultural processes related to OCS gas and oil activities in order to improve scientific predictive capabilities.

3. Experimental studies for better understanding of environmental processes, or the causes and effects of OCS activities.
4. Projects which design or establish mechanisms or protocols for sharing data or scientific information regarding marine or coastal resources or human activities in order to support prudent management of oil, gas and marine mineral resources.
5. Synthesis studies of scientific environmental or socioeconomic background information relevant to the OCS gas and oil program.

Methods A proposal process is initiated each year with a request for letters of intent to address one or more of the Framework Issues. The proposals are requested from university researchers and other scientific researchers in State agencies. A Technical Steering Committee made up of scientific representatives of the cooperators reviews letters of intent and proposals to be evaluated for possible funding. External peer reviews may be requested for new projects.

Products Primary products include quarterly reports, annual reports, final reports, and articles published in the scientific literature. Principal investigators also give presentations at ITM's and scientific conferences, or to various public. Other products include datasets, maps, visual aids, and technical meetings.

Importance to MMS By adopting this cooperative agreement, improved leasing decisions and EIS analyses pertinent to lease sales in the Beaufort Sea, Cook Inlet, Gulf of Alaska, and Chukchi Sea/Hope can be made. Final reports will be available for lease sales and post-sale decisions; interim data products and inputs will be used to address information needs. Topical areas to be addressed under the Coastal Marine Institute have been identified through this Annual Study Plan, the Framework Issues, and previous Alaska Region study plans. The study also will develop information that addresses public concerns raised during outreach efforts.

Date Information Required: Information products are required from 1 year to 6 months prior to proposed lease sales. Also, the information collected is required to be used in postlease decisions such as exploration plan reviews and approvals, and potential development-stage environmental impact analyses and related approvals, or in the implementation of lease-sale mitigating measures that require scientific information for implementation.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Interagency Agreement

Title: Management and Logistics of Oceanographic Equipment and Warehouse Storage for Oceanographic Equipment

Actual Costs (in thousands)

Period of Performance: FY 1996-2001

FY1996 - \$ 85
FY1997 - \$ 39
FY1998 - \$ 60
FY1999 - \$ 60
FY2000 - \$ 60
FY2001 - \$ 60
Total Cost: \$364

Description:

Background The MMS, Alaska OCS Region, has responsibility for equipment management in support of Alaska studies. In 1996 the General Services Administration (GSA) obtained a new storage facility for ESP use. The equipment is stored in a small warehouse in Anchorage, where it is maintained and made available for ongoing projects. This support element also provides funds for maintenance of the MMS Alaska Region Launch 1273, a small research vessel needed for various oceanographic studies, as well as funds for other equipment maintenance and shipping.

Objectives The purpose of this program-support element is to efficiently manage and store oceanographic equipment.

Methods The GSA arranges for an appropriate facility for our use.

Products A warehouse facility.

Importance to MMS Without funding of this program-support element, it would not be possible to maintain or deploy the 36-foot MMS Launch 1273 that provides a mobile, cost-effective, and specialized research vessel for a variety of biological and oceanographic studies throughout the coastal waters of Alaska. Costs for certain studies would increase significantly if more expensive marine-support alternatives were chartered. Additionally, it would not be possible to maintain an equipment warehouse that allows us to re-use and share equipment effectively among projects and agencies. This is a critical

program-support element related to studies that support all current leases. Funding for the next fiscal year is considered critical; the studies element cannot be deferred until the next budget period.

Current Status of Information: Not applicable.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Conference Management and Reports on MMS Results

Actual Costs (in thousands)

Period of Performance: FY 1996-2002

FY1997 - \$100

FY1998 - \$ 80

FY1999 - \$ 90

FY2000 - \$ 80 to \$120

FY2001 - \$ 48 to \$ 72

FY2002 - \$ 96 to \$144

Total Cost: \$494 to \$606

Description:

Background The Alaska ESP has organized many meetings on environmental studies information. Initially, synthesis meetings were sponsored through NOAA's OCS Environmental Assessment Program; the meetings involved scientists from many disciplines, and the main purpose was to synthesize their Alaska OCS information. During the past decade, the main focus has changed to small workshop for resolution of environmental issues and to large Information Transfer Meetings (ITMs) for the exchange of studies information among Principal Investigators and the general public. Also, the scope of the program changed to focus on a few prospective oil provinces on the Alaska OCS. During the 1970's and 1980's, most of the OCS environmental assessment information was collected through government-sponsored programs; however, during the past decade of exploration and development, a similar amount of environmental information has been collected through industry-sponsored, site-specific programs. In addition to the transfer of information through meetings, the ESP has transferred information through ITM Proceedings, reports and publications on MMS results.

Objectives The objectives are to produce ITM's, small workshops, and publications on OCS environmental studies information. We will plan and fund the eighth Alaska ITM during FY 2000 and anticipate the need for a small workshop during FY 2001. An ITM will be funded in FY 2002.

Methods The primary method is to provide for the logistical coordination of the meetings, and to help with preparation of publications.

Products The products will be printed Proceedings of the meetings and workshops; and peer-reviewed publications for selected topics.

Importance to MMS Continuation of this study will help to resolve environmental issues for MMS program managers and to increase public confidence in the data used by the OCS program. Further development of OCS prospects is anticipated during the next few years; so industry-sponsored research probably will provide an increasing portion of the environmental assessment information, which also will increase the need for information transfer and exchange.

Date Information Required: There is an ongoing need for the transfer of studies information, so ITM's or small workshops will be convened as needed, and the dates will be coordinated with lease sales and industry operations.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-02

Region: Alaska

Planning Area: Cook Inlet

Type: Cooperative Agreement with CMI

Title: Cook Inlet Workshop Support

Actual Costs (in thousands)

Period of Performance: FY 1999-2000

Total Cost: \$32

Description:

Background The waters of Cook Inlet are characterized by complex circulation with variability at tidal, seasonal, annual, and inter-annual time scales. While circulation is dominated by tidal flow, significant non-tidal circulation features exist, including a buoyancy-driven current flowing to the south along the western shore of the inlet, and a slow northward flow in the central and eastern parts of the inlet. Offshore production and ship traffic are accompanied by a risk for pollutants to enter the inlet, which may affect its productive fishery. Knowledge of the current patterns in the inlet is therefore important to determination and prediction of pollutant pathways.

Objectives The goals of the study are to:

1. Review information on the inlet's circulation.
2. Examine the oil spill trajectory models that are available.
3. Recommend field-based research objectives targeted at improving our understanding of the inlet circulation dynamics and supporting validation of numerical circulation/spill trajectory models.

Methods The work will be conducted during a workshop, which will be convened in Kenai during one or two days in autumn 1999. The target participants for this workshop will include scientists from the State and Federal government and academia who are currently conducting research in Cook Inlet, scientists with an interest in Cook Inlet, and numerical model specialists working on oil spill trajectory models. They also will include the State and Federal employees with an interest in the potential impact of human activities in Cook Inlet and business people from the major oil companies currently producing in Cook Inlet.

Importance to MMS The workshop goals are to meet several of the CMI framework issues, including:

1. A better understanding of Cook Inlet and how it may potentially be affected by oil and gas exploration.
2. Model development for better predictive capability.
3. A mechanism for sharing such data and information.

Date Information Required: Information from the workshop would be available for decisions about the upcoming Oil and Gas Leasing Program 2003-2008, and for an environmental assessment of possible future lease sales in that Leasing Program..

Submitted by: Alaska OCS Region

Revised Date: December 1999

**STUDY PROFILES FOR
Alaska Annual Studies Plan FY 2001-2002**

Part B. Profiles of Proposed Studies

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort, Chukchi, and Bering Seas and Cook Inlet

Type: Joint Funding/Inter-agency

Title: Update Digital Interactive Climatic Atlases

Estimated Costs

Period of Performance: FY 2001-2003

Total Cost:

Description:

Background This study will update and improve existing climatic atlases that will be a decade old. These atlases cover all planning areas in the Gulf of Alaska and the Bering, Chukchi, and Beaufort Seas. Improvements will be made in digital accessibility of data and consolidation of existing data. Although more than a fourfold number of marine data above 65°N. latitude were available in 1987 than for the same area in the 1977 atlas, the data amount remained inadequate to permit a detailed analysis by meteorologists or by computer-contouring routines.

Historical climatic data exist at the National Climatic Data Center in two Comprehensive Ocean Atmosphere Data Set files—file names TD-1170 (1854-1995) and TD 1129 (1980-1995). Both of these files have been updated to December 1995. The MMS has climatic data that have been summarized statistically by month in paper format updated to 1984. Open-ocean wind models used to provide gridded wind forcing to MMS OSRA models produce erroneous winds in the eastern U.S. Beaufort Sea, the southern Chukchi Sea, and several other coastal locations because of orographic steering and sea breezes. The budget for this study assumes 50 percent cost participation by other interested agencies.

Objectives The objectives of this study are to:

1. Acquire 1987 digital data presented in climatic atlases; (specifically sea surface temperature, wave height, precipitation, wind speed and direction, visibility, and air temperature).
2. Update climatic data to the present, collecting digital climatic data from the National Climatic Data Center, the U.S. Air Force's Environmental Technical Applications Center, and other applicable sources.
3. Synthesize and format climatic data in a relational database similar to hardcopy climatic atlases for digital use in charts, graphs, maps, GIS ArcView and Arc/Info software and word-processing applications.

4. Create the database on CD-ROM for use by other participating agencies, the public and MMS.
5. Format the monthly and annual climatic data formats needed by the Alaska OCS Region as necessary for entry into the Technical Information Management System (TIMS) data structure.

Methods This will be a three phase effort. The first phase within FY2001 will verify the availability of these digital data sets. A coordination plan would be developed with other interested Federal agencies. If a significant portion of the data are not available in digital format, then the study will not proceed to the next level of effort unless additional funding is made available. The second phase of the study in FY 2002 will collect previous digital data for the 1987 climatic atlas and update digital climate data to the present. The data will undergo quality-control using both computer and visual techniques to eliminate duplicate observations and questionable elements. The data will be synthesized into monthly data elements previously established in the 1977 and 1987 climatic atlases. The last phase of the study will compile the data into a relational database and develop GIS and other graphical tools to analyze and display the data.

Product CD-ROM digital relational database, Access or Spatial Database Engine/Oracle database, users' manual, one- or half-day workshop to demonstrate database and provide user training, peer-reviewed journal articles, and reports.

Importance to MMS The primary MMS need is for an electronic rather than a paper atlas. Paper climatic data are no longer fully adequate to meet MMS needs. MMS will load the data into the Corporate Environmental Database using Access or Oracle Spatial Database Engine. The data will be used for MMS oceanographic modeling efforts and those to characterize biological studies. The current paper atlas data are used by MMS analysts in the description of the environment as well as in setting the initial parameters for oil-spill-weathering models. The data are used by MMS and others for oil-spill-contingency planning. Because of expanding oil development in nearshore State and OCS waters, both MMS and the State of Alaska are particularly interested in a revised atlas with a comprehensive update of wind data for nearshore areas of the Beaufort and Chukchi Seas.

Date Information Required: There is continuous and increasing need for these data for EIS's and post lease assessments for all active planning areas.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Joint Funding/Inter-agency

Title: Updated Ice Atlas

Estimate Costs
Total Costs:

Period of Performance: FY 2001-2003

Description:

Background The most recent compilation of ice data information for the U.S. Beaufort Sea included a Beaufort Sea Atlas (compiled by Sohio in 1984) and an Alaskan Ice Atlas covering 1970-1983. In 1995, the National Ice Center (NIC) digitized the 1972 – 1994 unclassified hardcopy sea ice chart archive using services provided by the National Climatic Data Center (NCDC) in Asheville, NC. The charts were digitized as vector data, and then converted to ASCII gridded fields in the World Meteorological Organization's Sea Ice in Gridded Format. These data have 25 km resolution. Biweekly ice coverages are currently available from the National Ice Center in ARC/INFO for the years 1996-1999. Digital files of historical records may also exist with the Canadian Ice Center for the Beaufort Sea. RADARSAT imagery can provide high-resolution sea ice data, although those data have to be pre-processed. RADARSAT has a powerful microwave instrument that transmits and receives signals to "see" through clouds, haze, smoke, and darkness, and obtains high quality images of the Earth in all weather, day or night. This provides significant advantages in viewing the Earth under conditions that preclude observation by aircraft or optical satellites. Historical records of summer ice severity in the Alaskan Beaufort now date back to 1952 (44 years). Evidence shows that the 1990's have produced mild summers in keeping with warmer record temperatures worldwide. These changes in temperature need to be factored into MMS Beaufort Sea activities, both for lease sales EIS's and subsequent exploration or development and production activities. These conditions must be included in an updated modern summary of ice condition in the Beaufort Sea and along the Alaskan coast. Information has not been updated/consolidated since the mid-1980's. The budget for this study assumes 25 percent participation from other interested agencies.

Objectives The goal of the study is to provide accurate high resolution (approximately 5km) digital sea ice products for the Beaufort Sea. The data will be used to evaluate ice conditions for current and proposed oil and gas development plans, review exploration plans, and for EIS's. The sea ice data will be incorporated into the MMS environmental database, accessible by ARC/INFO/ArcView.

Specific objectives include:

1. Compiling and quantifying sea ice data collected from the 1970's through the 1990's into digital and geospatial formats.
2. Providing up-to-date description of Beaufort Sea ice environment for ongoing and future activities.

Methods The methods of this study are to:

1. Inventory existing reports, databases, and baseline studies.
2. Formulate a design plan for ice subjects of key interest, mapping requirements; tables; graphs, and other software enhancements which best portray information needs (i.e., ice growth, frequency of ice invasions, etc.) in user-friendly manner.
3. Prepare updated digital atlas which includes maps, tables, graphs to cover: fast ice stability and ice movements (late May to early July); summer nearshore ice invasions (July to September) and ice growth during winter (December to April).

Products A digital updated ice atlas for the Beaufort Sea which incorporates all available ice data. A retrievable database of sea ice coverages, user interface and analysis tools in Arc/Info.

Importance to MMS MMS will be better able to review development and production plans with the most up-to-date ice data. The maximum and minimum dates for ice formation and earliest and latest dates for projected use of ice leads are important variables in these plans. The most recent data on ice through 1983 does not reflect the warming climatic trends since 1983. The study will enable MMS to provide improved NEPA analysis for activities permitted by MMS.

Date Information Required: This updated ice information will be used for potential exploration and development plans. The earlier this information is available, the better position MMS will be in to review and evaluate plans. The study should be started in FY 2001.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Cook Inlet

Type: Joint Funding/Inter-agency

Title: Verification of an Oil-Spill Trajectory Model in the Cook Inlet and Shelikof Strait

Estimated Cost: **Period of Performance:** FY 2001 - FY 2002

FY 2001 -

FY 2002 -

Total Costs:

Description:

Background Over the past eight years, MMS has deployed several hundreds of satellite-tracked drifters for the purpose of measuring the surface currents and simulating oil spills in the Gulf of Mexico. The purpose of these activities was the verification and improvement of MMS's Oil Spill Risk Analysis (OSRA) model applied to the Gulf. However, no such verification study has been performed yet in Alaskan waters. Given the considerable differences in the physical oceanographic setting of these two regions, it is necessary to perform the same kind of verification of the OSRA model applied to Alaskan waters.

A few modest Lagrangian surface current studies have been performed in the Cook Inlet/Shelikof Strait. Burbank (1977) released drifters in and near Kachemak Bay; Muenich, Schumacher, and Pearson (1981) released drifters from lower Cook Inlet; and Reed and Stabeno (1989) released drifters in the lower Shelikof Strait. The latter study released a small number of oil-spill-simulating drifters for the purpose of testing how well these drifters would follow an actual oil spill, in this case the Exxon Valdez spill.

While useful, these past studies provide too little information for a comprehensive verification of MMS's oil-spill modeling in this area. Also, there have been no Lagrangian current measurements in the middle and upper Cook Inlet. The study outlined herein emulates the excellent drifter studies performed in the Gulf of Mexico and will help MMS verify and improve its OSRA conducted in support of lease sales in the Alaska Region. The budget figures above represent 50 percent of the cost of the study and assume 50 percent cost participation by other interested agencies.

Objectives The objective is the acquisition of a one-year-long, synoptic, Lagrangian realization of the mesoscale and tidal currents in the Cook Inlet and Shelikof Strait and concurrent meteorological observations, and oil-spill simulations numerous enough for a statistical verification of MMS's OSRA model applied to Alaskan waters.

Methods The surface currents will be observed by aircraft-deployed drifters as done in the SCULP and NEGOM projects in the Gulf of Mexico. Ten "CODE-type" drifters will be deployed every two weeks along the inlet and strait from a chartered aircraft for a total of 260 drifters. In each deployment cycle, two drifters will be deployed in each of the upper and middle of Cook Inlet and Shelikof Strait, and four drifters will be deployed in a rectangular array in the lower Cook Inlet. This deployment scheme may be adjusted later in the project if the earlier deployed drifter tracks suggest a better sampling scheme.

The drifters will be tracked by the ARGOS system employing "multi-satellite" service in order to better resolve the strong tidal signal in the currents. The drifters will transmit for 15 days and then automatically shut off. The choice of 15 days is based upon an expected Cook Inlet residency time of five to ten days, unlike the persistent drifters deployed in the northeastern Gulf of Mexico, which often stayed on the shelf for several weeks.

Concurrently, shipboard drifter deployments will be made from chartered fishing boats or volunteer fishermen if any can be recruited. At selected locations and/or locations of practicality, five oil-following "ARGOSPHERE-type" drifters will be deployed in Cook Inlet and in the Shelikof Strait. They will also be tracked for 15 days using Service ARGOS' multi-satellite service.

Finally, four NOMAD-type meteorological buoys will be deployed in the area for the one year of drifter observations. The National Data Buoy Center (NDBC) will install the buoys and provide MMS with the digital data. One mooring will be deployed in each of the subregions: upper, middle, and lower Cook Inlet, and the Shelikof Strait. Although the tides are the dominate currents most of the time, the locally forced, wind-generated currents will be important too, especially for the oil-spill simulating drifters.

Importance to MMS This project will enable MMS to verify and possibly improve its oil-spill risk modeling applied to Alaskan waters. This in turn will enhance the credibility of MMS' environmental impact evaluations in support of leasing in the Alaska region. Public acceptance of OSRA results and analyses will be enhanced if validated for Alaskan waters. This study will provide the data needed to validate OSRA.

Date Information Required: Data collection will be ongoing and the information will be fed into our data processing and analysis procedures.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive or Sole-Source

Title: Update of Coastal and Surf Zone Oil-Spill Transport Model (COZOIL)
Algorithms, Shoreline Databases and Interface for Use with Environmental
Assessment for Exploration and Development Scenarios, Beaufort Sea, Alaska

Estimated Costs **Period of Performance:** FY 2001-2002

Total Cost:

Description:

Background The Coastal and Surf Zone Oil-Spill-Transport Model (COZOIL) is a first-generation model that simulates oil-spill transport, spreading, longshore drift, shoreline oiling and re-oiling, and persistence of shoreline oiling. The COZOIL is the only oil-spill model that extensively examines shoreline oiling, and its shoreline oiling algorithms still define the state-of-the-art. We developed the COZOIL specifically to give MMS the ability to deterministically or stochastically project the fate of oil spills reaching specified coastlines for Alaska. We have recently updated the COZOIL user interface to work with the Windows 95/98 operating system. The user interface has significantly improved, allowing for an easier user entry of data and evaluation of results. This updated model interface has given the user the ability to visualize and evaluate the output from the model much more thoroughly than before. Preliminary evaluations of the new model output suggest many inherent weaknesses in the old code and databases. The weaknesses within the physical processes of the model are being addressed by an approved study "Update of Circulation and Oil-Spill Trajectory Model for Beaufort Sea Nearshore Development". This study will provide COZOIL with the means to incorporate a hydrodynamic model into the nearshore trajectory portion of COZOIL. The database portion of COZOIL is being addressed by the approved study titled "Environmental Sensitivity Index Shoreline Classification in the Beaufort Sea," and "Synthesis and Collection of Meteorological Data in the Nearshore Beaufort Sea". The shoreline study will provide new shoreline segment data for those areas between the Colville River and Pt. Barrow in the west and the Canning River to the Canadian border in the east. The wave model and trajectory portion of the COZOIL model will be greatly improved by added new wind time-series data collected under the latter study.

Objectives The goal of this study is to provide MMS with an updated COZOIL model that more clearly reflects the nearshore physical processes and databases for the nearshore Beaufort Sea. Specific objectives include achieving enhancements to hydrodynamic components, wave model sub-routines, updated shoreline oiling algorithms, stochastic wind modeling, and linkage to GIS systems.

Methods This is a modeling, data-synthesis, and user interface enhancement study. More robust algorithms will be applied to the COZOIL model code based on data from the literature, coordination with other MMS studies and regions, communications with key scientists, and COZOIL-user experience. This model will use the most recently collected data to update the shoreline database and other databases needed to run the updated algorithms more efficiently. The model's components and shoreline databases will be linked to ArcView or Arc/INFO Geographic Information System(GIS). The specific methods of this study are to:

1. Incorporate the output from the nested near shore hydrodynamic model developed for the study "Update of Circulation and Oil-Spill Trajectory Model for Beaufort Sea Nearshore Development."
2. Replace RCPWAVE with a more robust wave model and include the data from the study "Synthesis and Collection of Meteorological Data in the Nearshore Beaufort Sea," RCPWAVE is a short-waved, predictive model.
3. Update the shoreline database by inputting new information from other studies..
4. Provide COZOIL with a flexible database for the import of new data.
5. Evaluate the COZOIL shoreline oiling algorithms in original COZOIL code.
6. Update the algorithms, incorporating any improvements suggested by current literature, and insert improved algorithms into the model. Allow the model to run in stochastic mode using wind time-series data.
7. Link the oil-spill model to a full functional Geographical Information System (GIS) ArcView or ARC/INFO.

Products Updated and improved COZOIL model and integrated ArcView/ARC/INFO GIS, 2-day workshop to demonstrate model and provide user training, users' manual, final report, journal paper, and presentation at a major oil spill conference.

Importance to MMS The COZOIL model and integrated GIS resulting from this study will be a critical evaluation tool for assessing the risks of oil spills related to exploration and production activities. The updated and improved COZOIL model will enable: testing of scenarios based upon historical data; the possibility to track a real-time oil spill from Federal waters, offshore (circulation/trajectory) to near shore reaches (COZOIL); and determination of localized beach effects and other environmental impacts on near shore marine habitats. It will also be of assistance to State and local authorities in response to oil spills and in contingency planning for placement of near shore response equipment. The study is important for outreach. Inability to quantify shoreline oiling is a weakness in the MMS OSRA identified in a MMS OSRA workshop in 1992.

Date Information Required: The need for an oil-spill model that projects shoreline smearing of oil spills is an ongoing issue with the public for the current lease-sale schedule and for the preparation of future EIS's. COZOIL would be important in the evaluation of oil spill contingency plans for future development projects in the Beaufort Sea and for the Beaufort Sea Lease Sale scheduled for 2002.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive

Title: Monitoring Hydrocarbons and Trace Metals in Beaufort Sea Sediments (Year 5)

Estimated Costs

Period of Performance: FY 2001-2002

Total Cost:

Description:

Background The MMS initiated an environmental monitoring program in the Beaufort Sea in 1984 to assess the potential area wide or cumulative effects of gas and oil exploration and development. The program is designed to detect and quantify long-term changes in the concentrations of metals and hydrocarbons in sediments and animal tissues. Its design is based on recommendations from a workshop conducted by the MMS and the NOAA in 1983. The initial phase of the monitoring study was a 3-year program with field sampling and analyses taking place in 1984, 1985, and 1986. Subsequent sampling was recommended for every third year but took place only in 1989. The ANIMIDA study reoccupied 14 of the monitoring stations in the Liberty to Northstar area in 1999. This proposed study would be the fifth area-wide sampling of this program and would also provide the opportunity to evaluate effects on sediment quality of the decade-long existence of the Endicott causeway and development. The area surrounding the Endicott Field was specifically sampled in the 1989 monitoring study to obtain near-field baseline data. Because current practice is to not discharge muds, cuttings, and formation waters during development and production, environmental concerns are shifting toward gravel-construction effects such as may have occurred at Endicott and to pre-potential spill baselines.

Objectives The objectives of this study are to:

Year 1: Review the existing Beaufort Sea Monitoring Strategy for contaminants based on new statistical design review, Beaufort Sea data made available since 1989, and improvements in state-of-the-art.

Year 2:

1. Detect and quantify possible accumulation of discharged hydrocarbons trace metals, and naturally occurring radioactive material (NORM) in benthic sediments and organisms of the Beaufort Sea that may result from cumulative discharges from OCS activities, State oil development, or from long-range atmospheric transport.
2. Identify possible sources of contaminants.

Methods Surface sediments and organisms will be collected at sampling stations in the nearshore area between Barter Island and Cape Halkett. Stations will be selected to detect onshore-offshore gradients and gradients laterally away from oil- and gas-exploration activities. Samples will be analyzed for barium, chromium, lead, zinc, and cadmium using several analytical techniques. Mercury will be added to the list of metals analyzed. Gas chromatography-flame ionization detection and gas chromatography-mass spectrometry will be used to determine concentrations of saturated hydrocarbons and PAH. The NORM will be determined using state-of-the-art methods. Samples for nonoil-industry-related AMAP contaminants will be collected and forwarded to AMAP lead agencies, the EPA, and the NOAA upon their request, for their analysis.

Products Final report and peer-reviewed journal article.

Importance to MMS The results of this study will be used as part of monitoring for the Northstar and Liberty developments. In addition, the AEPS prescribes that signatory Arctic nations control six types of pollutants including oil, radioactivity, persistent organic contaminants such as PAH, and metals. The AEPS prescribes specific actions to control these pollutants, including monitoring and assessment through AMAP. For trace metals, AMAP has now identified mercury and cadmium as the metals of greatest Arctic concern. The MMS, with the help of national experts, designed and implemented a Beaufort Sea Monitoring Strategy requiring triennial re-sampling (Houghton, Segar, and Zeh, 1984). The EPA's "Alaska Exemption," allows continued offshore oil industry discharge in Beaufort Sea waters. It has heightened public concern about, and State and Federal agency interest in, the fate of potential discharges, despite that fact that current practice does not include such discharge.

Date Information Required: Information from this study will be used in preparing EIS's and in reviewing exploration and development and production plans. This proposed study will constitute an update of monitoring-information database. The baseline data of this study is needed prior to production from Northstar and Liberty units, scheduled for 2001 and 2003, respectively, and for the Beaufort Sea Lease Sale 176 EIS.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Gulf of Alaska

Type: USGS Biological Resources Division or Competitive

Title: Modeling Recovery Rates for Avian Populations

Estimated Costs **Period of Performance:** FY 2001
Total Cost:

Description:

Background At least ten avian species, principally loons, waterfowl and shorebirds are found in the Beaufort Sea region and may be at potential risk of effects of oil and gas development on the Alaska OCS. Several species are listed under the Endangered Species Act (ESA) or have experienced unusual declines in recent decades. MMS documents have included estimates of the time needed for vulnerable avian populations to recover to their original level following an oil spill or other mortality event, but such estimates often are relatively subjective. Because concern over the nature of previous analyses has been expressed by the U. S. Fish and Wildlife Service (FWS) in recent document review comments, it is important that MMS use statistically improved estimates of the potential for population recovery from possible mortality events.

Objectives The goal of this study is to develop a computer model that will estimate the time required for populations of avian species occupying the Alaska OCS to recover from certain levels of mortality caused by contact with an oil spill, or other perturbation. For each species this effort would require accomplishing the following objectives which are to:

1. Develop a model incorporating all variables and parameters required to yield realistic and accurate estimates of the time needed for each population experiencing various one-time mortality losses to recover to its initial level.
2. Develop the model into a stand-alone interactive program with the capability to generate recovery rates associated with user-specified values for variables and parameters.

Methods A spectacled eider model of the type required by MMS has been developed recently; this can provide a basis for modeling other seaducks, and together with other existing models, a starting point for modeling other species groups. Species with highest priority for model development would be spectacled eider (model available), oldsquaw, common eider, king eider, yellow-billed loon, brant (model forthcoming), Steller's eider, Pacific and red-throated loons, and red-necked phalarope. Lower priority species in areas where oil and gas development may occur in the future include common and

thick-billed murre, black-legged kittiwake, marbled murrelet, and wintering Steller's eiders. Data for various demographic parameters for some species currently need to be supplemented. Values necessary to model recovery rates for these species will require using appropriate values for such parameters taken from the literature. The Beaufort Sea Waterfowl monitoring study funded by MMS beginning in summer 1999 is expected to fill in some of the data gaps for oldsquaw and eiders. Once a generic model for each species group is developed, appropriate data for species of interest will be substituted and require relatively little modification of the basic model.

Products A stand-alone report for each species modeled, with sample calculations and including an interactive electronic version of the model with instructions that will allow MMS to calculate population recovery rates for other species, parameter values, and mortality levels.

Importance to MMS MMS analyses could benefit substantially from the addition of more accurate determinations of recovery rates following assumed losses from populations of species for which there is concern over the status and trend, or those listed under ESA. Information provided in this study would respond to concerns expressed by FWS and environmental organization reviews of Northstar and NPR-A.

Date Information Required: Preliminary information required early in FY 2001 for the Liberty project, early to mid-FY 2001 for Beaufort Sea Sale 176 EIS.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive

Title: Analysis of Covariance of Human Activities and Sea Ice in Relation to Fall Migrations of Bowhead Whales

Estimated Costs

Period of Performance: FY 2001-2002

Total Costs:

Description:

Background Comprehensive analysis of the potential effects on bowhead whales of oil-industry activities has been limited by the resolution of data available on these activities and by disparate survey methodologies used to obtain whale data. Quantitative data on historical human/industrial activities and sea ice in the Alaskan Beaufort Sea will become available upon completion of the study "Reference Manual and GIS Overlays of Oil-Industry and Other Human Activity (1970-1995) in the Beaufort Sea", to be completed in 2000. This study will compare that information with available bowhead distributional and behavioral data. Specific hypotheses will be tested to determine statistical significance of relationships of key variables.

Objectives The goal is to determine the significance of hypothesized relationships of previous oil-industry activity and sea ice on the Beaufort Sea distribution and behaviors of bowhead whales. Specific objectives are to:

1. Assess the comparability of bowhead whale data collected by site-specific and broad-area surveys and the feasibility of pooling these data to detect whale distributional shifts or behavioral changes up to 40 miles from noise sources.
2. Obtain from available information appropriate measures of sea ice for covariant analysis with whale distribution data.
3. Present preliminary tests and findings, define biases and assumptions, and recommend appropriate statistical procedures (e.g., analysis of covariance, regression techniques, K-S tests, spatial analysis, computer modeling) to a Scientific Review Board.
4. Apply applicable procedures to test hypotheses on relationships of the timing, location, and activity status of oil-industry/human activity and the distribution and behavior of bowhead whales (1979-1998).

Methods This study will utilize existing data in the recently developed MMS database for Beaufort Sea human activity and data in the MMS Bowhead Whale Aerial Survey Project database. It will consider positions and daily activity status of each drilling platform, helicopter, icebreaker, and other support vessels. It will adopt similar measures between years to facilitate interyear comparisons and trend analysis. It will control for presence of commercial vessels, subsistence hunting, and low-flying aircraft. It will evaluate site-specific and wide-area data from MMS- and oil-industry-funded surveys of the fall distribution of bowhead whales (1979-1998) for applicability and pooled analysis. Using appropriate inferential statistical procedures, it will then test hypotheses for significant relationships of human activities and bowhead distribution and evaluate power of tests. A final report will be produced, suitable for a wide audience, including North Slope subsistence whaling villages.

Products Final report and peer-reviewed journal article.

Importance to MMS Information from the study will be valuable to the consultative process under the existing stipulation on subsistence whaling and other subsistence activities (Stipulation No. 5, Sale 170). It addresses long-standing concerns about oil-industry activity raised by subsistence whale hunters. It addresses site-specific information needs expressed by oil-industry representatives at previous government workshops on developing site-specific monitoring guidelines. It addresses important study recommendations made at the Arctic Seismic Synthesis and Mitigating Measures Workshop (Barrow, Alaska, March 1997).

Date Information Required: Study information is needed for the Liberty Development and Production Plan EIS and for post-lease permit approvals for all Beaufort Sea sales (Sales BF, 71, 124, 144, 170, and 176).

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Joint Funding/Inter-agency

Title: Post-Summering Distribution and Movements of Arctic Beluga Whales

Estimated Costs

Period of Performance: FY 2001-2003

Total Cost:

Description:

Background Beluga whales are important subsistence species for indigenous people of the Alaskan Arctic and sub-Arctic coasts; more than 300 belugas are harvested annually by Alaska Native subsistence hunters. Studies funded by OCSEAP/MMS in the early 1980's provided information about reproduction, food habits, and distribution and abundance in summer. More recent studies conducted by the Alaska Department of Fish and Game (ADF&G), National Marine Fisheries Service (NMFS), and the Alaska Beluga Whale Committee (ABWC) have provided information about harvest levels, genetic stock identify, and abundance in summering areas. Satellite tagging offers a proven cost-effective and technologically sound approach to obtaining information needed on migration patterns and feeding areas. Belugas have been captured and instrumented with satellite-linked tags at a variety of locations across the Canadian Arctic. However, belugas tagged in Canada are only one of several beluga stocks that are important to Alaska subsistence hunters and that are presumed to winter in the Bering Sea. Data are needed on the other stocks, particularly the Chukchi Sea stock. The study will emphasize cooperation between the MMS, local government, subsistence hunters, and scientists in its planning and execution.

Currently, the Alaska Beluga Whale Committee is working cooperatively with ADF&G, the NSB, and NMFS in a pilot study to attach satellite tags to beluga whales in Alaska. In 1997, two ABWC representatives (one scientist, one hunter) participated in the highly successful joint MMS-FJMC tagging venture in the Mackenzie estuary. During July 1998, tags were successfully placed on belugas at Point Lay. This pilot study has limited resources available to the participants. It is anticipated that additional support from MMS would expedite this study. It would also be cost-effective for MMS to participate in this study with other cooperating agencies. The above budget represents 50 percent of the estimated total cost.

Objectives The objectives of this study are to:

1. **Develop a cooperative study plan to capture and satellite tag beluga whales from the eastern Chukchi Sea and eastern Bering Sea stocks.** Cooperators in this study will be ABWC,

ADF&G, NMFS, the North Slope Borough), Kawerak, MMS, and other interested parties as appropriate.

2. Determine seasonal movements and diving behavior of the Chukchi Sea and eastern Bering Sea beluga whales. Determine which regions of the pack ice they use, both in Alaska and along the Chukotka coast of Russia, after leaving coastal summer concentration areas.

Methods Satellite-linked tags will be applied to beluga whales during summer/fall at optimal locations in the Chukchi and Bering Seas. The tags will be designed to give frequent, periodic locations along with time and date of transmission, in addition to data about dive depth and duration. Data will be downloaded into a GIS (ARC/INFO) database and displayed and analyzed along with sea-ice information. Dive depth tags will be evaluated against a detailed bathymetric grid.

Products Educational information and data link to rural schools, report to International Whaling Commission, final report, peer-reviewed journal paper, and field data in ARC/INFO GIS format.

Importance to MMS The study will increase our knowledge of the migratory movements, wintering behavior, and feeding areas of belugas in Arctic waters. Information from this study will be used in support of environmental assessments for Arctic lease sales. This study is especially pertinent due to the prominence of beluga whales in Alaskan Native culture and subsistence practices. This information will be needed for post-sale mitigation and exploration plan reviews. A 1994 NRC report recommends satellite tagging, stock identification, and monitoring studies for belugas.

Date Information Required: The study will collect one year of tagging data prior to Beaufort Sea Lease Sale 176. Interim reports will be available to MMS following each tagging season. Real-time location data for tagged belugas will be available to all cooperating parties throughout the project.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-2002

Region: Alaska

Planning Area: Cook Inlet

Type: Inter-agency or In-house

Title: Aerial Surveys of Cook Inlet Beluga Whales in Winter

Estimated Costs

Period of Performance: FY 2001

Total Cost:

Description:

Background

Beluga whales (*Delphinapterus leucas*) near ice react occasionally to noise from approaching ships at distances of ≥ 50 km. Noise from vessel traffic associated with oil development activities might potentially disturb and displace belugas from preferred habitat areas. Because the Cook Inlet population, currently estimated at less than 300 whales, has declined sharply over the past several years, the National Marine Fisheries Service (NMFS) has proposed listing this population as depleted and/or threatened. MMS in-house aerial surveys conducted in February-March 1997 suggest the area around Kalgin Island and East Forelands in upper Cook Inlet may be important habitat for this geographically isolated population during the late winter period. Comprehensive transect surveys across winter months are needed to confirm the importance of this area.

Objectives The primary goal of the study is to determine areas of Cook Inlet important to beluga whales during winter months. Specific objectives are to:

1. Design and implement a protocol of repeatable aerial transects to determine geographic relative abundance of Cook Inlet belugas in various winter months.
2. Implement the protocol to determine the geographic relative abundance of belugas.
3. Compare relative abundance with ambient ice conditions, bathymetry, water temperature, currents, tides, fish runs, etc.

Methods Aerial surveys would be based out of Anchorage, Alaska. We anticipate the use of flights during optimal weather conditions to result in 10 surveys completed during November-December, 10 during January-February, and up to 10 in late March. The sample design would consider dedicating a higher percentage of effort in survey blocks where beluga whales have been observed previously. The design must account for expected unfavorable survey conditions in parts of Cook Inlet on any given day.

Wider surveys of lower Cook Inlet, Kodiak, and Shelikof Strait during the winter would also be considered. Incidental sightings of other marine mammals would be recorded.

Products Final report and peer-reviewed journal article.

Importance to MMS The study will provide information on the winter distribution and habitat use of beluga whales in the Cook Inlet-Gulf of Alaska OCS Planning Area for future oil-and-gas leasing, especially the Section 7 Consultation with NMFS if the population is declared “threatened” under the Endangered Species Act. The beluga whale is currently an important subsistence species for indigenous people of Cook Inlet, especially those from Anchorage, Matanuska–Susitna, and Kenai boroughs.

Date Information Required: The information is needed to develop the next Cook Inlet Biological Evaluation and Draft EIS anticipated for the next 5-year plan.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Joint Funding/Inter-agency

Title: Testing Bowhead Whale Responses to Offshore Oil-and-Gas-Development Noise

Estimated Costs
FY 2001 -
FY 2002 -
Total Cost-

Period of Performance: FY 2001-2002

Description:

Background The study addresses current differences between scientific results and traditional knowledge on bowhead responses to oil-industry noise. It will directly measure received sound levels and distances from oil-industry activities at which: (1) the behavior and physiology of individual whales becomes affected, thus making them harder to hunt; (2) course deflections begin to occur; and (3) whales return to their normal migration after passing industrial activities. The study avoids limitations of other experiments that relied on predicted (rather than actual) sound levels or dropped sonobuoys that only spot-check sounds received by whales. Study information also addresses other concerns on where and how long migrating whales stop to feed, whether some whales migrate farther north than reported, and where fall whales go after migrating past Barrow, Alaska. We propose to this study in cooperation with other concerned entities such as AEWC, NSB, NMFS, and the oil and seismic industry. The MMS would provide only partial funding for the effort, contingent on other agency and industry participation.

Objectives The goal is to confirm actual received sound levels and measured distances at which individual bowheads respond to seismic and other oil-industry noise. Specific objectives are to:

Phase I (Year 1)

1. Involve subsistence whale hunters in project planning and potential Year 2 testing.
2. Assemble and test satellite transmitter packages for bowhead whales that record geographic position, time, heart rate, dive depth, and continual underwater sound levels.

Phase II (Year 2)

3. Attach transmitter packs to bowheads in Canadian waters prior to the fall migration and track tagged whales in real time across the Alaskan Beaufort Sea.

4. Activate an industry-sponsored airgun array west of tracked whales and monitor their approach, diversion, and course resumption west of an industry-sponsored test vessel.
5. Correlate geographic positions, dive depths, heart rates, surfacing rates, and whale calls with known source levels, received sound levels, and measurable distances from noise sources.
6. Determine actual received sound levels and distances from industry noise at which tracked whales divert and/or their physiological patterns are altered.
7. Observe/detect startle effects when seismic airguns are turned on and any cumulative effects of repeated exposures to oil-and-gas-industry noise.
8. Analyze ancillary data on the time spent by tracked whales in various geographic areas and correlate with any available observations of whale feeding.

Methods **PHASE I (Year 1):** Use off-the-shelf or previously tested components to assemble, integrate, and test a satellite tag/attachment mechanism for bowhead whales that logs precise geographic position, time, heart rate, dive depth, and underwater decibel levels. Minimize potential interference with the fall whale hunt by involving the AEWC and Whaling Captains Associations in Barrow, Nuiqsut, and Kaktovik, Alaska, in the planning, scheduling, and implementation of potential Year 2 tests. Obtain Federal Permits and other authorizations for adequately testing responses of tagged whales to an airgun array. Coordinate seismic vessel participation with any oil-industry activities planned for 2002 **PHASE II (Year 2):** In cooperation with other agencies, implement objectives 3-11 (above). Monitor responses of tagged whales to other industrial activities to obtain potential cumulative effects information. Reposition the test vessel west of certain tested whales and repeat tests with airguns or prerecorded drillship noise. Ancillary data on instrumented whales would be analyzed over the life of the tag.

Products Final report and peer-reviewed journal articles.

Importance to MMS Results of the study will be used to implement mitigating measures such as Sale 170 stipulations on "Industry Site-Specific Bowhead Whale Monitoring" and "Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence Activities". The study addresses important study needs identified at the Arctic Seismic Synthesis and Mitigating Measures Workshop (OCS Study, MMS 97-0014) and a major concern on seismic operations and "skittish" whales presented by AEWC to the OCS Policy Committee Meeting in Girdwood, Alaska (May 26-27, 1999).

Date Information Required: The information would be needed for post-lease Exploration Plans in the Beaufort Sea, post-lease activities supporting Development and Production Plans (DPP) at Northstar and Liberty, as well as future DPP's and EIS's..

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-2002

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas

Type: USGS Biological Resources Division or Competitive

Title: Distribution and Movements of Spectacled Eiders in the Beaufort Sea

Estimated Costs **Period of Performance:** FY 2001-2002

Total Cost:

Description:

Background During interagency discussions of the Northstar pipeline alternatives, spectacled eider use of Beaufort Sea waters was a prominent topic. The U.S. Fish and Wildlife Service Northstar Biological Opinion summarized the small amount of information available concerning spectacled eider distribution and use of the Beaufort Sea as follows. Of 15 males tracked by USGS-BRD satellite telemetry between June 10 and July 10, half traveled from Prudhoe Bay to the Chukchi Sea in the 3 days between satellite relocations, so no information on route or Beaufort Sea use was obtained. Five males spent 7-11 days in Harrison Bay and there were 6 relocations in western Simpson Lagoon. Females occupy Beaufort marine habitats over a more extended period, from late June to mid-September. Of 13 females tracked, 10 were located at least once before they arrived in the Chukchi Sea. Relocations indicated an average residence period of 4 days. Females generally were farther offshore (average 22 km) than males (average 10 km). Little use is made of marine habitats by either sex prior to these molt migrations. Data on spectacled eiders acquired from the "Monitoring Beaufort Sea Waterfowl and Marine Birds" aerial study could be integrated with this study data.

Objectives The basic goal of this study is to determine the timing and extent of use of Beaufort Sea waters by spectacled eiders staging prior to their annual molt migration. Specific objectives are to document:

1. The chronology of transition from terrestrial (nesting) to marine habitats (molt migration).
2. Spectacled eider timing of use and dispersal to specific Beaufort Sea areas, and the residency times of staging males and females in these areas.
3. Movements of staging/migrating spectacled eiders in the Beaufort Sea and timing of egress to southern latitudes.

Methods This project is expected to require the annual effort of a minimum of 3 persons in the field for 4 weeks, including aerial surveys for 10 days (4 hr/day), to locate prospective individuals for instrumentation. Individuals to be instrumented with satellite transmitter tags will be located on nesting areas, using ground search and/or aerial survey techniques. Standard techniques will be used to capture, handle, and instrument eiders. Standard satellite telemetry techniques will be used to determine timing of use, residency times, movements, and routes traveled by instrumented eiders. The study will be coordinated with other ongoing government and industry waterfowl studies in the Beaufort region.

Products Interim annual reports describing results for each year, a comprehensive final report, and a peer-reviewed journal article. Data on eider distributions and movements in a format importable into ArcView and TIMS Oracle databases will be submitted with the final report.

Importance to MMS The vulnerability to oil spills of spectacled eiders (and that of other eiders and oldsquaw) is a continuing concern regarding OCS developments. Data from this study will provide improved definition of the risk to this ESA-listed species. Also, it will provide information on marine distribution and habitat used by spectacled eiders allowing improved definition of mitigating measures required to reduce the number of situations with potential for incidental take.

Date Information Required: Information will be required for post-lease assessments for the Northstar and the Liberty projects.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: All Alaskan Planning Areas

Type: USGS Biological Resources Division or Inter-agency

Title: Alaska Marine Mammal Health and Contaminants Database

Estimated Cost
Total Cost:

Period of Performance: FY 2001 - 2002

Description:

Background The Alaska Marine Mammal Tissue Archival Project (AMMTAP) was funded by Minerals Management Service (MMS) in 1987 as part of National Oceanic and Atmospheric Administration's (NOAA) Outer Continental Shelf Environmental Assessment Program. Initial AMMTAP objectives were to develop methods for field sampling and long-term storage of frozen tissues (under optimal environmental conditions). This Alaskan study, now conducted for MMS by the US Geological Survey (USGS) Biological Resources Division (BRD), in cooperation with the NOAA Fisheries Office of Protected Resources (OPR) and the National Institute of Standards and Technology (NIST), became the model for nation-wide tissue archival. Analysis of tissue aliquots, a routine quality-control measure at AMMTAP, provides a wealth of information on contaminants but this information is not always readily available to management agencies and subsistence villagers making timely decisions about the safety of the environment and subsistence food. The Alaska Frozen Tissue Collection provides a computer catalog of tissues available for analysis. This catalog potentially could be linked with other central locations to quickly access synoptic analytical data on marine mammal contaminants. For example, the Native Science Commission has a database on contaminants for Alaska subsistence species that may be suitable.

Objectives The primary goal is to enhance the availability of published and unpublished contaminant data on Alaskan marine mammals for more immediate use by scientists and subsistence hunters. Specific objectives are to:

1. Incorporate published and unpublished AMMTAP data into a web-linked relational database.
2. Incorporate and/or link to additional contaminant and histopathological data on Alaskan marine mammals.
3. Investigate the addition of spatial analysis and mapping features.

4. Create and demonstrate a menu-driven interface for management agencies and subsistence villagers in a searchable user-friendly format.

Methods Where possible, all data sets will be compiled and converted to standardized formats. A multi-agency web site will be developed for the initial point of public access to the database and all partner agencies will maintain direct links to the site from their respective pages. Data could be potentially be provided by State health agencies, Environmental Protection Agency, US Fish and Wildlife Service, and US Geological Service (USGS), Biological Resources Division. Histopathology data using the SNOMED system adapted by the USGS National Wildlife Health Center will also be made web-accessible.

Importance to MMS Questions about how oil-and-gas drilling and petroleum may potentially affect animal health, environmental contamination, and the safety of consuming subsistence species are of vital importance to many MMS constituents. The study provides accessible information on contaminant analyses directly to subsistence-hunting villages and other users.

Date Information Required: The information made accessible by this effort will be necessary to address concerns raised in the environmental impact statements for future coastal and offshore developments.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: USGS Biological Resources Division or Competitive

Title: Use of Sea Ice Habitat by Polar Bears in the Southern Beaufort Sea

Estimated Costs **Period of Performance:** FY 2001-2002

Total Cost:

Description

Background Polar bears (*Ursus maritimus*) occupy ice-covered seas in northern and western Alaska. Polar bears remain with the sea ice throughout the year, and their range generally reflects the seasonal extent of sea ice. Availability of their principle prey, ringed seals (*Phoca hispida*), is dependent on the form and stage of sea ice. In particular, the near-shore region of the Beaufort Sea is an important hunting area for polar bears soon after the autumn ice has formed. Near-shore ice also serves as a stable substrate for maternal dens during the winter, and as an area in which seals are hunted by adult female bears with their new young during the spring.

Petroleum companies have extended their activities to include these nearshore areas as potential locations for exploration, construction of facilities, and extraction of oil. In addition to existing development, the petroleum industry will likely become increasingly interested in developing nearshore polar bear habitat as new recoverable hydrocarbon deposits are identified. Industrial development in polar bear habitat may result in displacement of bears from foraging and denning habitat because of activities associated with exploration and construction. Bears may die or experience chronic negative health effects as a result of spills of crude oil or other chemicals. In general, polar bears may be exposed to toxic substances and have an increased likelihood of direct interactions with humans.

Polar bears inhabit an environment that constrains direct observation of their behavior. Additional information about habitat use by bears would help managers make decisions regarding how to conduct human activities relative to sea ice conditions in polar bear habitat in the southern Beaufort Sea. With better data on polar bear behavior, the effect of human perturbations could possibly be reduced if human activities were managed to take into account polar bear ice-habitat relationships. Data on polar bear movements and sea ice conditions exist but have not been merged to permit analysis of polar bear habitat preferences relative to ice conditions.

Objective The objective of this study is to quantitatively describe the ice habitat types preferred by polar bears in the southern Beaufort Sea.

Methods Polar bear locations obtained by satellite radio-telemetry will be associated with NOAA weekly ice charts. Ice charts that include the coast of the Beaufort and Chukchi Seas are available and updated on a weekly basis from the National Ice Center (Washington, D.C.). This information will be obtained from the National Ice Center through the Internet. Charts are geo-referenced and ice is identified by form, stage, and the percent of open water. Data are available either as GIF files for producing hard copies or as geographic information system (GIS) software ARC/INFO export files for spatial analysis. Locations have been recorded for instrumented adult female polar bears in Alaska since 1985. ARC/INFO will be used to extract ice habitat attributes and attach those attributes to polar bear locations. Habitat preferences and avoidance will be analyzed using log-linear statistical models. Habitat use will be compared by season and reproductive status of bears.

Products The final product will be a published report of polar bear habitat use. Because the sea ice environment changes throughout the winter months, knowledge of important habitat features will allow flexible management strategy that will change as sea ice conditions change. This report can be used in conjunction with NOAA ice charts, allowing managers to make decisions on a weekly basis in order to minimize negative impacts of industrial activities in polar bear habitat.

Importance to MMS Polar bears are highly susceptible to spilled oil. The species is protected under the Marine Mammal Protection Act and any “take” by disturbance, mortality, or otherwise requires a Federal Permit. Concerns of polar bear welfare raised in environmental impact statements can be addressed by the information gained through this study. Industrial activity in the southern Beaufort Sea is ongoing and will continue into the future, necessitating baseline data of polar bear habitat use.

Date Information Required: This study supports the Beaufort Sea Lease Sale scheduled for 2002 and future exploration and development activity.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-2002

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Joint Funding/Inter-agency

Title: Traditional Knowledge/Western Science Bowhead Whale Migration Seasonal Report

Estimated Costs

Period of Performance: FY 2001-2003

Total Cost:

Description:

Background The MMS will continue incorporating pertinent traditional knowledge in its EIS's. The wealth of Native observations on area wildlife, particularly bowhead whales, is vital to this effort. This project would synthesize valuable input by subsistence-whale hunters and others concerning annual bowhead whale migrations. Observations about particular bowhead migrations are not readily available to non-Natives. Scientific and regulatory information relative to bowhead migrations is not always readily available to Native villagers in a reader-friendly format. The synthesis of this information provides an unprecedented opportunity for MMS to bridge the gap between traditional knowledge and scientific results.

Objectives The objectives of this project are to:

1. Offer a pilot forum for observations by government-agency and oil-industry scientists, subsistence-whale hunters, and the subsistence-whaling community focused on the spring and fall migrations of the bowhead whale.
2. Provide a synthesis of scientific results and Inupiat observations of bowhead whale behavior.

Methods Twice annually for 3 years, the pilot forum would gather information put in a reader-friendly report that includes narrative descriptions by the Whaling Captains' Associations in Barrow, Nuiqsut, Kaktovik, and St. Lawrence Island about the:

1. Bowhead migration near their whaling grounds.
2. Weather and ice conditions.
3. Unusual natural occurrences or whaling incidents.

4. Village whaling success.

The AEWC would report on locations of whale takes, the bowhead migration as a whole, and the annual quota. Each issue could contain photos of whales and related seasonal activities of subsistence-whale hunters and the subsistence-whaling community. This should provide an accurate representation of pertinent Inupiat subsistence hunters' knowledge. The same volume would also summarize in layman's language scientific findings about particular bowhead migrations by the MMS Bowhead Whale Aerial Survey Project, NMFS, National Weather Service, North Slope Borough, Russian scientists, and other scientists. The text of the report would contain side-by-side English and Inupiaq-language translations. The information collected from the community would be carefully coordinated with appropriate subsistence organizations. This study presents a joint-funding opportunity that could be established as a cooperative agreement between MMS, the AEWC, and the NSB. A cooperative agreement would ensure whale hunter input and data, proper adherence to protocols, and Inupiat translation expertise. This all would be designed to be mutually beneficial to the parties. The budget figure above represents the MMS portion of the total budget which is 50 percent of the total cost of the study.

Products Reports twice annually for 3 years on bowhead migrations. Peer-reviewed journal article.

Importance to MMS Information from the project will be important to the consultation process under the existing stipulations on subsistence whaling and other subsistence activities. Both scientific findings and traditional knowledge have value in interpreting specific bowhead migrations. Making it easy to utilize both bodies of knowledge through the same forum will help administrators avoid misunderstandings, and will, in effect, facilitate a melding of both knowledge systems.

Date Information Required: The reports should be available on a long-term basis (2000 and beyond) to improve communications about industry activity during bowhead whale migrations associated with the Northstar and Liberty projects and Lease Sale 176. The study would also facilitate information about postlease exploratory drilling activity deriving from the upcoming Beaufort Sea Lease Sale 176.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, and Hope Basin

Type: Competitive

Title: Monitoring Key Indicators of Socioeconomic and Cultural Change of Communities on the Alaskan North Slope

Estimated Costs

Period of Performance: FY 2001 – 2005

Total Cost:

Description:

Background The Alaska OCS Region previously funded the Social Indicators Study which was completed in 1995. This study employed a multi-year panel based on the Solomon four group design. It established a number of indicators that are capable of establishing the impact of offshore development on a number of social, economic and cultural features. The Social Indicators Study was initially designed to measure socioeconomic effects at the community level with and without oil and gas activity. The North Slope communities of Barrow, Nuiqsut, Kaktovik, Anaktuvuk Pass, Wainwright, and Pt. Hope were sampled extensively in the development of the indicators. A workshop sponsored by MMS in 1996 helped focus on the direction for further study. This study and other socioeconomic studies funded by the MMS, the North Slope Borough, and the Alaska Department of Fish and Game, Division of Subsistence have contributed to an understanding of the culture and economy of the indigenous people of the Alaskan North Slope. With the first development and production activity proposed offshore in the Beaufort Sea, and other offshore and onshore activities ongoing, there is a need to monitor socioeconomic and cultural changes of communities on the Alaskan North Slope. Other studies also have been conducted on the North Slope that contribute to the foundation of a monitoring effort. These studies, however, which addressed only parts of the complete issue cannot substitute for a comprehensive monitoring effort. In addition, the results of these studies cannot uniquely be linked to the same informant which leads to the statistical error of ecological fallacy.

Objectives The goal of this study is to monitor socioeconomic and cultural indicators for communities on the Alaskan North Slope. Specific objectives include:

1. Determine subsistence harvest patterns affected by ongoing oil and gas development.
2. Determine whether younger Natives are hunting more or less than elders as a consequence of oil and gas development.

3. Determine how the cash component of the households affects participation in subsistence activities.
4. Assess Natives stress by ongoing and proposed oil and gas developments.
5. Assess how oil and gas activities have affected the sharing of subsistence resources.
6. Compare results of sampling from this study to the previous study completed in 1995.

Methods For the subsistence activities associated with Nuiqsut, Barrow, and Kaktovik, the method will focus future socioeconomic and cultural monitoring on key social indicator variables, probably sampling no more than 20 variables using the instrument and methodology designed in the 1995 MMS-funded “Social Indicators Study.” These variables will be the most demonstrably sensitive and reliable of the social indicators measuring cultural strength and changes in levels of subsistence. These variables will be key to the first five items identified in the objectives above. Monitoring selected key will allow analysts to ascertain the differential effects of offshore development while controlling for a number of other features in the social, cultural and regulatory environment.

Products The products will include a narrative report that integrates the following methodologies:

1. Harvest surveys.
2. Social and economic surveys.
3. GIS database.
4. Oral histories.
5. Ethnographies.

Importance to MMS Two important offshore prospects are on-line for development in the near future, with construction activities scheduled to begin for Northstar and Liberty, respectively. Analysis of the scoping testimony of these development project and past exploration projects indicates that about two thirds of the testimony was concerned with potential impacts of OCS activities on subsistence activities. The Alaska OCS Region believes a monitoring system is imperative to the continued integrity of the indigenous people of the North Slope. Such a monitoring system would serve as a necessary “ground truth” to accurately assess the cumulative effects on the culture and economy of the North Slope.

Date Information Required: Monitoring should be carried out in FY 2001-05. Continuation will be assessed in 2005.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-02

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Competitive

Title: North Slope Borough Economy

Estimated Costs

Period of Performance: FY 2001

Total Cost:

Description:

Background The focus of the social and economic studies of the Alaska OCS Region of the MMS has been the potential for increase in offshore oil and gas activity. Many MMS socioeconomic studies were based on scenarios of change from no-industry activity to development-stage activity. However, through 1999, industry activities in all Alaska OCS leased areas had gone only to the exploratory phase, and industry activities onshore in Alaska currently are in decline. Although there was much greater production in the 1980's, reduced production at Prudhoe Bay fields in the 1990's and attractive international exploration and development opportunities are additional factors affecting property tax revenues to the North Slope Borough (NSB). This historical economic activity and its effect on NSB revenues/expenditures, provides a context for anticipated upcoming offshore development and production at Northstar and Liberty and their potential effect on regional and local economies. A descriptive characterization of historic and recent North Slope economic activity due to onshore activities is necessary in order to evaluate relative significance of projected offshore development.

Objectives The objectives of this study are to:

1. Describe revenues and expenditures of the North Slope Borough, 1975 to the most current year available.
2. Portray how the North Slope Borough, as the local government, and individuals and households anticipate dealing with decline in revenues from the oil industry.
3. Provide a comparative basis for assessing potential economic effects of upcoming offshore oil and gas activity.

Methods The methods of this study are to:

1. Make a quantitative and narrative description of North Slope Borough revenues and expenditures for each year from 1975 through the most current year available for capital projects. The capital

improvement program (CIP) for each year will group projects by categories, such as education, roads, housing, airports, light, power and heating systems, public safety facilities, sanitary facilities, and so forth. Classify local government services by departments of the NSB and other major categories.

2. Using the institutional profile analysis method focusing on key informants, determine how the NSB, as the local government, anticipates responding to a decline in revenue.
3. Also using key informants, determine how individuals and households anticipate responding to a possible economic change, such as doing more subsistence hunting or moving to areas in Alaska where cash jobs are available.

Products Descriptive analytic technical report. Technical summary and non-technical summary for the general public not versed in technical terminology. Peer-reviewed journal article.

Importance to MMS This study will be useful to MMS in assessing potential economic impacts of OCS development activity on the NSB and NSB residents with respect to revenues and expenditures, employment, subsistence and migration. It will provide a region-wide perspective of the economic effects of recent on-shore oil and gas development against which upcoming OCS economic effects may be gauged.

Date Information Required: This information will be used for the 2003-2008 Five Year Program EIS, post-lease environmental assessment of Beaufort Lease Sale 176, and probable lease sales in the Oil and Gas Leasing Program 2003 to 2008.

Submitted by: Alaska OCS Region

Revised Date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001-2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, and Hope Basin

Type: Joint Funding/Inter-agency

Title: Investigation of Sea Level and Climate Change in Arctic Alaska for the Past 20,000 Years

Estimated Costs **Period of Performance:** FY 2001-2002
Total Cost:

Description:

Background The history of past sea level stands during the last 20,000 years is complicated and inadequately understood in Arctic Alaska. Sea level has fluctuated from approximately 10 feet above to over 250 feet below its current level. Primarily, data from sea level investigations done by USGS in the Bering Sea Region during the mid-1960's is still the standard used in all Arctic and subarctic Alaskan areas today. Recent academic research funded by the NSF and other national and international research organizations in Alaska and Siberia has shown that climate change and sea level are directly related and are much more temporally and spatially complex than previously thought. Because of this, general sea level curves for the Bering Sea region constructed decades ago do not accurately reflect some sea level events in the Chukchi and Beaufort Seas.

Other national and international research programs and initiatives such as results from PARCS (Paleoenvironmental Arctic Sciences--Arctic Paleosciences in the context of Global Change), IMAGES (International Marine Global Change Study), PALE (Paleoclimate from Arctic Lakes and Estuaries), and studies from the International Arctic Research Center (IARC) may provide partnerships for funding and research collaboration. The budget figures above represent the MMS portion which is 50 percent of the total cost of the study.

Objectives The objective is to coordinate an integrated program of onshore and nearshore landform mapping, and organic sample collection for age-dating along the northern Alaska coast to establish a higher resolution climate and sea level history for the past 20,000 years. This sea level history will help establish an up-to-date sea level curve that will serve as the basis for a much needed new archaeological baseline study for the Arctic and Bering Sea OCS planning areas. In addition a high frequency sea level history will assist in the assessment of environmental changes, establishing whether they are naturally occurring or anthropogenically driven.

Methods The methods of this study are:

1. Thorough review of existing studies and onshore topographic maps, aerial photographs, and satellite imagery, and offshore bathymetric maps for delineation of landforms possibly created or modified by smaller order higher and lower past sea level stands on the decadal and millennium scale.
2. Compilation of data and mapping of landforms.
3. Review of relevant current and past micropaleontological and archaeological investigations.
4. Review existing data and select sites and areas for field investigations.
5. Conduct field investigations of onshore landform mapping, organic sample collection for age-dating, and documentation. Work from base camps along selected coastal locations, supported by helicopter and small water craft.
6. Conduct concurrent nearshore fathometer transects for mapping bathymetry and seafloor sampling for micropaleontological, and sediment data using a small boat.
7. Compile field research and laboratory analysis. Integrate field data with data from existing maps and investigations including "Evaluation of Sub-Sea Physical Environmental Data for the Beaufort Sea OCS and Incorporation into a Geographic Information System (GIS) Database" (#AK 99-02).
8. Establish a new sea level database for the Regional archaeological baseline study.

Products Final report and peer-reviewed journal article.

Importance to MMS

1. Establishing a new and accurate sea level history is important for protection of archaeological resources by better understanding where people may have migrated, hunted, and established camps and settlements. Understanding and resolving higher frequency sea level fluctuations is critical to understanding the wider swings of rising and falling sea level that have affected the OCS.
2. Understanding the age, origin, morphology, dynamics, and stability of paleo-features and the ecological consequences of past sea level stands is useful in assessing subsea pipeline routes and areas of pipeline landfalls, as well as for monitoring short-term and medium-term environmental effects on and of pipelines such as those proposed for offshore Beaufort Sea North Star and Liberty production areas.
3. Adding to sea level history and paleo-landform aspects of Study #AK 99-02
4. Enhancing resolution of Arctic sea level changes pertinent to the general study of climate change and essential to the increasingly focused study of Polar climate change. This will be useful in determining whether changes and in the nearshore and shoreline environments are the result of naturally occurring cyclic events or are due to changes in human activities such as offshore oil and gas in the Arctic.

Date Information Required: Oil and Gas Leasing Program 2003 to 2008.

Submitted by: Alaska OCS Region

Revised date: December 1999

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2001 - 2002

Region: Alaska

Planning Area: Cook Inlet

Type: Joint Funding/Inter-agency

Title: Cook Inlet Research Project Tracking System

Estimated Costs

Period of Performance: FY 2001

Total Cost:

Description:

Background Most of the common problems facing the public, researchers, and managers in Kachemak Bay and all of Cook Inlet is the poor understanding of the research needs, and the public understanding what agencies are doing. MMS could cooperatively support the development of a sustainable tracking system to identify and track research, monitoring, and agency management/planning activities for Cook Inlet and its watershed. This project would coordinate very well with the Cook Inlet Information Management and Monitoring System (CIIMMS) and other organizations such as the Kachemak Bay National Estuarine Research Reserve (KBNERR). CIIMMS is coordinating efforts with other agencies as a single web-based source of information for Cook Inlet. This effort is being supported by the Exxon Valdez Trustee Council.

Objectives The goal of this study is to develop a computer web-based tracking system that will receive information from government agencies and organizations studying Cook Inlet and its watershed. The system will be installed on a single site that is accessible to the public and researchers. The system will accept information from all users and compile the project information into a database. The database will be searchable by all agencies, organizations and the public.

Methods The methods of this study are to:

1. Develop a database structure that can capture project specific information on agency and other organizations' activities.
2. Compile the information into a user- friendly database and interface for all constituents to access.
3. Develop a web-based search-engine for the project database.

Importance to MMS A successful system to track the ongoing research in Cook Inlet and its watershed will allow MMS to focus its limited funding by acquiring only needed data, and working cooperatively with other agencies and organizations.

Products User friendly database.

Date Information Required: Coordinate with the development of CIIMMS and the KBNERR project databases currently being developed for the purpose of studying the Cook Inlet and its watershed. The project funding will be needed by FY 2001.

Submitted by: Alaska OCS Region

Revised Date: December 1999

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